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INDEX TO RAILROAD ADVERTISEMENTS.

	PAGE.		PAGE.
Chicago, R. I. & Pacific	594	Chicago, Alton & St. Louis	596
Milwaukee & St. Paul	594	Hannibal & St. Joseph	596
Leavenworth, Lawrence & Galveston Railroad	594	North Missouri Railroad	596
Kansas Pacific	594	Pacific Railroad of Missouri	596
Chicago & Northwestern	595	Pennsylvania & Ft. Wayne	597
Pan-Handle	595	Erie Railway	597
Western Union	595	Illinois Central	598
Chi., Burlington & Quincy	596	Michigan Southern	598
		Michigan Central	599

For Table of Contents, see Page 586.

EVAPORATION METER FOR BOILERS.

Trials made at different times of the evaporative effect of different constructions of boiler and different kinds of fuel have shown considerable variations in the relative amounts of steam produced. The cause of these variations may be looked for—first, in the construction of the boiler and its setting; second, in the quality of the fuel; third, in the qualification of the fireman.

The fuel for steam boilers forms such a large item in the expense account that it is certainly of the greatest importance to owners of boilers to make themselves familiar with the proportion in which the production of steam stands to the quantity of coal used, and to reduce the latter if possible.

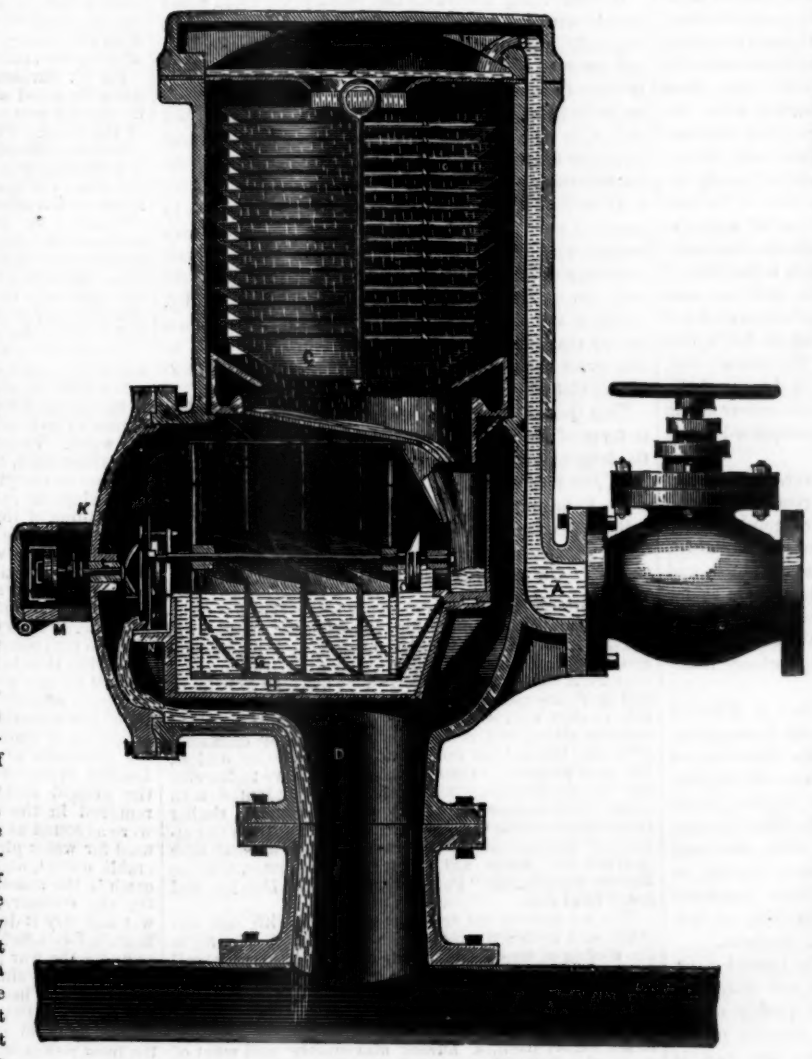
Official trials of the evaporative effect of different construction of boilers, and different qualities of coal, give important information; but attentiveness and skill of the fireman, a very important factor in the saving of fuel, cannot be tested by single trials, but only by continual watching, and increased only by introducing a system of wages, which depends upon the amount of coal saved. The important results obtained by the latter system are clearly proven by the fact that, since its introduction in the case of locomotives, an average saving of fuel of over ten per cent. has been obtained thereby.

On railroads the record of each locomotive is made up from notes of the freight carried, and the distance traveled. The differences in the grades of the road are regulated by coefficients.

With boilers for stationary purposes, such a system of control cannot be employed, for the kind of effect is generally variable, and a true measure for them does not exist. Moreover, the useful effect is dependent not only upon the engineer and fireman, but also upon every workman operating a machine. A more direct index of the efficiency of the fireman is the exact measure of the steam produced. At different times attempts have been made to determine this point, by passing the water fed to the boiler, through a meter. Most of these meters have been condemned on account of their want of accuracy and durability. All water-meters, however, are not adapted to steam boilers, as they do not note the temperature of the feed-water. The chief point is, not to ascertain the quantity of the water evaporated, but to establish the amount of heat applied to the boiler by the combustion of the fuel. The ratio of the quantity of heat made useful to the amount contained in the fuel forms the basis for estimating the efficiency of the fireman, and the perfection of the boiler construction. The feed-water offers the means for measuring the effective quantity of the heat, but it is not sufficient to measure its quantity alone—the temperature at which it enters the boiler must also be carefully considered.

In trials of short duration, the temperature of the feed-water can be noted and entered in the calculation, but in practice this can not be done when the object in view is not one short trial, but that continuous observation which is necessary for a complete control of the fireman.

The evaporation meter, which we here present, answers every demand. It is not damaged by hot water, the measurements are correct, and it records the temperature of the water entering the boiler, so that on its index-dial the quantity of heat made effective may be read off in heat units. It will be seen on examining the annexed cut, that the water which enters the apparatus rises upwards through the channel *B*, and falls on the cascade *C*, over which it flows slowly downwards. By this means the feed-water comes in direct contact with the steam of the boiler, which has free access to the interior of the apparatus through the pipe *D*. The feed-water is thereby heated to the temperature of the steam, and falls with the condensing water into the box *E*. It then enters through the passage *F*, the drum *G*, which contains six helix-shaped compartments. The drum is closed on one side, except the central opening, through which enters the passage *F*, and is open on the other side. The lower part of the drum is immersed in the semi-cylindrical basin *H*, the upper edge, *J*, of which is below the lower edge of the passage *F*. The entering feed-water fills the compartments, and thereby causes the drum to revolve. The number of the revolutions of the drum is exactly proportionate to the quantity of water passing through. To reduce the friction in the journals as much as possible, the shaft of the drum rests on its two ends, at *O* and *N*, on friction rollers. The water passing out at the open end of the drum falls over the edge *J*, into the steam boiler. The revolutions of the drum are transmitted to the shaft *L*, arranged with conical packing, passing through cover *K*, and operating a counting apparatus, placed outside the steam-room. A small air-cock on top of the upper cover serves to permit the escape of the atmospheric air brought over by the feed-water.



Evaporation Meter for Boilers.

As one of the merits of this apparatus we may mention that it is constructed without any packing. Moreover, the drum effects the measuring with such accuracy that it excels in this respect any other water meter, and this accuracy is not influenced in the least by impurities carried along by the feed-water. The formation of scale will disturb the action of this apparatus much less than any other known water meter, there being, as already stated, no packing whatever, and all the cross sections being very large. The registering apparatus is entirely removed from the influence of water and steam. The basin with the drum, as well as the cascade, can easily be taken out and cleaned from scale either by the hammer or by treating it with diluted muriatic acid.

Another great disadvantage of other water meters is that in case of interruption in their functions the feed of the boiler is entirely stopped; such a case cannot happen with the evaporation meter described above.—*Dingler's Polytechnisches Journal.*

A New Combination.

At a recent special meeting of the stockholders of the New York & New Haven Railroad Company, a contract which had been made for a consolidation of interests and management of their road with the Hartford & New Haven Railroad was approved, and the directors were authorized to lease the Shore Line Railroad. They also accepted amendments to their charter relative to the construction of new bridges over the Housatonic River Norwalk harbor. By the contract with the Hartford & New Haven Company the property of the two roads and their future management is to be placed in the hands of a board of managers, ten in number, five of which are to be selected from each board of directors of the two roads; that all gross receipts realized from operating the two roads in question are to be divided in the proportion of fifty-seven hundredths to the New York & New Haven Company, and forty-three hundredths to the Hartford & New Haven Railroad Company, the directors of each company declaring and paying the proper dividends to the stockholders thereof respectively. All future improvements are to be made at the joint expense of the two companies in the proportions stated.

At a meeting of the Shore Line Railway Company the lease of its road as agreed upon by the directors of these three companies was consummated.

The New York & New Haven road extends from Williamsbridge, N. Y. 14½ miles northeast of New York on the New York & Harlem Railroad, eastward along the north shore of Long Island Sound to New Haven, 62¼ miles. The Shore Line Railroad extends from New Haven along the coast 50 miles to New London. The Hartford & New Haven road is 61⅜ miles long with a branch from Berlin to Middletown, 10¾ miles. The entire mileage of the combined lines is 187 miles.

Contributions.

DETERIORATION OF BOILER PLATES.

BY P. BARNES, JR.

It is very doubtful whether any trustworthy evidence exists of any change in the *quality* of iron in boilers during their use, excepting where it is in immediate contact with the intensely heated gases in the fire box, or with the burning fuel itself. There is no evidence that sulphurous gases, such as exist in a locomotive fire-box, are injurious to or are taken up by *melted* iron in a Siemens' gas furnace, into which no solid fuel is put, even at a higher heat than is found in a locomotive, and that the plates of a fire-box should suffer from such gases is doubtful. It is possible that, where the burning coal is in close contact with the walls of the fire-box, some combination of the impurities of the coal may actually take place with the iron, rendering it brittle; but it seems more probable that the chief reason why coal burning fire-boxes, when made of iron, are so soon destroyed is their exposure to the fierce local heat of the fire, which, in a greater or less degree, is known to prevent that close contact of the water with the other side of the plates which is necessary to carry away the heat of the fire, and this contact of the water with the plate is never obtained to the fullest extent with the comparatively sluggish circulation of a locomotive boiler; and for this reason, aside from any effect produced by incrustations, the plates may become much more highly heated than is naturally due to the proper condition of the boiler.

In rolling mills it is known that piles of iron for making rails, or for other purposes, if left longer in the heating furnace than is necessary to bring them to a welding heat, become "dried," or the cinder, a silicious material, being so long melted, runs entirely out from the pores of the iron, and hence is wanting when the pile is rolled, so that the welding properly of the iron, which is in part due to the presence of this cinder, is lessened, and the strength of the bar or plate is thereby reduced. The structure of wrought iron, even of the best brands, is that of a mass of fibres, each one of which is surrounded and closely enveloped by this silicious material, so that the strength of a bar or plate is due, not to the cohesion of the particles of the iron itself to each other, but to the weaker cohesive force of the particles of iron and cinder. It may be seen that this cinder, which forms a constituent part of the plate in the iron fire-box, is gradually wasted away by the fierce heat, and the plate is thereby weakened so that cracks appear as the inevitable result of the heavy pressure maintained in the boiler.

When plates of steel are used, however, the radically different properties which this metal possesses, due to the principles of its manufacture, are most clearly shown. Steel is in fact the purest form of iron which has yet been made for ordinary commercial use, and being thus a pure metal, there are no filaments of cinder to separate the metallic particles and prevent that vastly stronger cohesive attraction between them which steel possesses, and to which alone the strength of any material is due.

A bar of steel, when broken, shows a different grain from that of almost any iron, and this is due to the fact that the metallic particles are, by the operation of the melting furnace brought close upon and against each other, and are not, as in the case of iron, pasted together by the silicious slag, and stretched out into long fibres by subsequent working. Since, then, the steel fire-box plates contain only a slight trace of this slag or cinder, it is plain that this fact may be one important reason of the very greatly increased durability of such plates, even when exposed to the most trying heat.

Many boilers are greatly weakened by corrosion, or, to use a simpler word, *rusting*; but this can hardly be called with correctness a change in the *quality* of the iron. It is more truly a change in the *quantity* of the iron, or the thickness of the plate, because iron rust is certainly not iron, and any such weakness, or any explosion resulting therefrom, can never be justly attributed to obscure or mysterious causes.

There is no evidence that incrustation of itself and alone does any harm whatever to the strength of any boiler. It is only when, as upon the fire-box plates, it prevents the free absorption by the water of the heat from the fire, that injury to the plates can occur, and then it is caused by the excessive heating already noticed. It has frequently been found that rivet heads and the edges of plates will be heavily crusted with lime or salt, and thus perfectly preserved from rusting, and that no diminution of their strength is caused thereby. There are many sets of locomotive tubes also which have outlasted without injury more than one fire-box, even though when removed from the boiler many of them were found to be heavily cased with lime or other mineral substance. These tubes are subjected for only a very small part of their length to the great heat of the fire-box, and hence their strength is nearly always perfectly preserved throughout the rest of their length even though hard crusts may have formed upon them. Incrustations always diminish the evaporative power of any boiler, but this is quite a different question from any relating to its strength.

STEEL CRANK PINS.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of September 3d there appeared a paragraph relating to the breakage of steel crank pins, which may be exactly stated, but for the credit of the builders of the engines referred to, I hope there is some room for doubt. A writer who gives so broadly the name of the locomotive works, ought not to have failed to learn the name of the works which made the steel in question, and also the price paid.

I can hardly believe that any observing man, having to do with railroad machinery, would really believe that little or nothing in favor of steel crank pins could be said, because this fact is perfectly well settled, beyond any doubt, that steel, when made from the best materials, and in the best manner, is from one and a half to two and a half times stronger than even the Low-Moor iron that was formerly so much used and preferred for crank pins; and it is also perfectly well settled that this strength may be obtained in grades of steel which are so very soft that the metal is absolutely more free from danger of sudden breakage than any iron that was ever known.

It seems really incredible that crank pins should break merely with the jar resulting from a collision so slight that neither pilots nor tender frames, according to which end received the blow, should have been at all shaken. If these facts be really as claimed, a statement of them ought to have included some further information, not only as to who made the steel, but also whether it was forged or heated by any unskilful men after leaving the manufacturer's hands, whether it was properly annealed, as all metal for such uses should be, whether the pins in question were really large enough, or had any sharp corners where fillets should been left in turning them, how they were put into the wheels, whether they had ever given trouble by working loose, and, finally, whether the engines in question had ever been much run by that class of men sometimes found who seem to take great pleasure in *slipping* their engines, regardless of the violent jar and shock produced thereby.

That there is something, and indeed much, to be said in favor of steel crank pins would seem to be shown by the large and constant use of the metal for that very purpose, and for uses even more trying.

I am simply, FAIR PLAY FOR STEEL.

ROCK ISLAND, Sept. 13, 1870.

On the Preservation of Timber.

The subject of our present paper is one that has occupied a leading position among the scientific questions of the day at any time within the memory of the present generation. Since the commencement of the present century it has been the subject of no less than 45 patents, and there are some on record in the last century. We believe that, with some unimportant exceptions, these are now all expired, and any detail of their specialities is of course beyond our limits, and would also be useless. We only propose to refer to them as we have to describe the various processes which have been adopted with more or less success with a view of preserving timber from what?—from wet rot, from dry rot, from the attacks of land and marine insects (of which we shall take as types the white ant, of tropical climates, and the Teredo Navalis, the "Paal Worm" of the Dutch), and lastly from fire.

Wet rot and dry rot are often confused with one another, and we briefly distinguish them thus: Wet rot is the rotting of unseasoned timber, by what we may call the fermentation and subsequent putrefaction of its own sap, of which the most noted and disastrous instance of modern times were the gunboats made for the Crimea. Dry rot is a similar result produced by causes external to the timber itself, a humid atmosphere and want of ventilation being, however, almost always if not invariably attendant causes.

In tropical climates, notably in India, the white ant will devour the interior of massive timber beams, leaving a mere shell on the exterior, until collapse tells the tale of the mischief that is done; and it is well known that in the seventeenth century, Holland, that country reclaimed from the sea, and which to this day owes its existence to the durability of its dykes, was seriously threatened with inundation by the destruction of the timber of which they were constructed by the "Paal Worm."

Such are the foes we have to encounter, and we propose to give a short account of the methods that have been adopted with more or less success in the attempt to defeat them. The earliest attempt on record at the "Preservation of Timber" was made when Noah built the Ark, and "pitched it within and without with pitch." And, strange as it may appear, when our remarks are concluded, it will be seen that the material then employed, or a cognate one, is the leading commercial article of the present day for the same purpose.

To return to modern times, the earliest patent on record was taken out by Alexander Emerson in 1737; the ingredients were boiled oil and some chemical compounds, and it was simply applied in a heated state to the outside of the timber. John Lewis, in 1754, prepared a kind of varnish from plantation tar, which he used in the same way. Humphrey Jackson, in 1768, patented a process for boiling the wood in a solution of chalky matter, or a preparation of vitriol. In the early attempts, mostly designed for shipbuilding purposes, we find the first suggestions of the subsequent processes which have successively contended for their share of public support.

In the first quarter of the present century many more patents, based more or less upon the same principles, were taken out, until in 1832 we meet with an entire novelty. "Kyan" took out a patent for preserving timber and other materials by soaking them in a solution of corrosive sublimate or chloride of mercury. There are various instances, as, indeed, there exist of many of these processes, of complete success; but the difficulties were great; the material, as is well known, is a dangerous poison, and so insidious in its effects that the men employed in the work become subject to salivation, or the result of mercurial poisoning, and thus a practical difficulty arose.

Another objection was its cost; it was too expensive to be used efficiently at a paying price for the market, the trade was subsequently transferred to a company, and got into disrepute, and commercially we may say that kyanising is no more.

In 1837, Mr. Margary enrolled a patent for the preservation of various materials by soaking them in a solution of sulphate of copper—the blue vitriol of commerce. This had an undoubted success, and, though the patent is expired, is occasionally employed at the present time, especially abroad, in certain situations to which we shall further allude. The objection to this, and to all the other processes where the timber is impregnated with a soluble salt, is that under the changes of atmospheric temperature, especially if the work is alternately wet and dry, as in tide, the work gradually absorbs moisture from the atmosphere, and in process of time the efficacy of the preservation disappears.

Sir W. Burnett's patent is dated 1838, and he impregnates the wood with a solution of chloride of zinc, which he states forms an insoluble compound with the albumen of the wood. This process was to some extent used for government works, and where it can be kept always dry, it undoubtedly hardens the wood and protects it from the attacks of insects; it has also the effect of rendering it almost incombustible, but in practice during a course of years, it has been found that it is subject gradually to atmospheric influences, and its efficiency is materially impaired by lapse of time if it is exposed to weather. As to the method of application of these solutions, so that they may thoroughly permeate the wood, or sufficiently so for protective purposes, we propose to give full detail in the sequel.

In 1841 Payn's principle was patented. It consists of using two solutions in succession, which act upon each other with the object of forming an insoluble substance in the pores of the wood, *e.g.*, sulphate of iron and carbonate of soda will form oxide of iron in the pores of the wood. Various modifications of this process are still sometimes used, but there is no firm in existence for the purpose of carrying them out. We may almost say the Paynising, the same as Kyanising, is commercially speaking, a thing of the past.

We now come to another process, patented by Mr. Bethell in 1838, which, unlike those already described, mostly, if not entirely, out of date, now occupies an important position among the commercial undertakings of the day. It consists in impregnating the timber with creosote, or heavy oil of tar, and upon this subject we shall go into considerable more detail.

Having thus briefly sketched the evils to be guarded against in the preservation of timber, and the various processes adopted for their prevention, we will proceed to a few remarks upon the durability of different descriptions of timber, under different circumstances, giving instances of success and failure. The piles of Old London Bridge were of elm, and after being driven into the ground under water for 800 years those that were removed in the course of erection of the new bridge were as sound as when they were first driven. Elm was used for water pipes during the last century to a considerable extent, and its power of resisting decay in damp earth is the reason of its universal use for coffin boards. On the contaary, when elm is exposed alternately to wet and dry it decays rapidly. The unfortunate gunboats before alluded to were in part constructed of elm, as under the war pressure the authorities had given permission to use elm instead of oak in planks, and as after a few months' use the gunboats were drawn up on on the slips, the timber was placed exactly in the position where its rapid decay was a matter of certainty. As the most powerful contrast to the above example of decay we may quote many instances in mummy cases and other works executed by the ancient Egyptians more than 3,000 years ago; which, though the record of the actual process is, of course, lost, present all the appearance of the best method of creosoting as executed at the present day.

The question of dry rot is one so familiar to all of us that we do not propose to quote any examples, except that both in seasoned and unseasoned timber it arises from various species of growth of a fungoid character, which decompose and reduce to powder not only the sap but the organic tissue of the wood itself, and there is this peculiarity about it that the germs of the fungi in a building that is once infected appear to be carried out as it were in the air, and that it is not necessary that actual contact should take place between the whole and the infected portion for the spread of whatever we may term the disease, whereas in the wet, no actual contact contact between the decaying or putrifying portions and sound wood seems necessaary. So that we may describe dry rot as infectious and contagious while wet rot is only contagious.

It has been ascertained that wood grown in situations where fungi abounded is more subject to dry rot than other kinds, and we may here remark that in the docks we have often noticed timber stocked so as much to facilitate the development of the germs of decay, which it has evidently contained when unloaded from the ship.

With regard to the worm there are various species, some of which prey upon wet timber and some upon dry. One called the *lymexylon* does serious damage in oak stacked in large quantities in the north of Europe. There other species of minor importance with the detail of which we need not trouble our readers.

Of marine insects the *teredo navalis*, and called by French engineers the *taret*, is an inmate of many of our harbors. Portsmouth, and other ports round the south, Great Grimsby, Lowestoft, and other places without end can tell their tale of the destruction and expense occasioned by its ravages, in some instances piles of 14 square being eaten away to 4 in., and in some cases totally destroyed. The insect next in importance is the *limnoria terebrans* especially found in southern climates, but its habits are not so well known, the same opportunities of observation not having occurred, as has been the case in regarded to the *teredo*.

Having thus given a short account of the various causes of decay, and an historical sketch of the different processes adopted for preservation, we may further remark that in ordinary house-building the dry rot is one principle enemy, while the offensive smell of creosote renders it inapplicable for internal use. We must, therefore, seek our remedy in the salts, the sulphates, or the chlorides. Where the work is protected from the weather they have been shown to do their work with perfect success; while the preservation of timber from fire can be efficiently attained, but for all external purposes, such as railway stations, piles, sleepers, bridges, &c., where the smell of the creosote is no objection, that is the cheapest and most effectual method. We now propose to give a detailed description of the most extensive establishment of the day in which works for the preservation of timber from decay are being carried on, and to add some remarks on their general commercial position of the question at the present time, with notes of some of the most successful instances of its application.

Referring to the various processes already described above, we now propose to give a short synopsis of what is now doing, remarking that the creosote process far exceeds all the others in extent and importance. With a view of ascertaining how the work was done, and what facilities existed for the adoption of various processes, we paid a personal visit to the premises of Messrs. Burt, Boulton, & Haywood, adjoining the commercial docks, an extensive wharf, covering four acres of ground. The same firm have also a similar establishment at the Victoria Docks of five acres in extent, the two together forming the largest timber-preserving, or, as the phrase goes, *pickling* establishment in the world, and we will briefly describe what we saw. The late Mr. Burt was probably the greatest authority upon the subject, and for some of the detail given above we are indebted to a paper by him read before the Institution of Civil Engineers, in 1863, on the "Nature and Properties of Timber." We were accompanied by the present head of the firm, Mr. Boulton, to whom we are indebted for very complete information.

The failure of many of the earlier processes doubtless arose from the fact that they relied for the saturation of the timber, with whatever material they employed, upon simple soaking; the great variety in the density of various qualities of timber, and even the difference between different pieces of the same kind, rendering the result uncertain; while, unless by actually weighing the timber after the process had been completed, there was no satisfactory means of ascertaining what quantity of solution was absorbed by each piece. Boiling was sometimes resorted to, but with a somewhat similar result.

Many years of experience have led to the adoption of the principle of injection in a vacuum under pressure, which we shall now describe. In the establishment in question there are four large cylinders, 6 feet diameter, of various lengths up to 80 feet, in which the timber is pitched. They are of the same construction as an ordinary steam boiler, and the timber is run into them on rails, on which travel small trucks or trolleys upon which the timber is piled. When the cylinder is charged, it is closed by a spherical shifting end, which swings around upon an arm, and completely closes it with an air-tight joint, and is secured in its position by shifting iron clips round its entire circumference. The cylinder being charged and closed, the next process is the exhaustion by an air-pump, worked by a 20-horse power engine; and, for the information of those similarly engaged, we may state that the cylinder is considered ready at the point indicated by 20 deg, of the Bourdon vacuum gauge. When this point is reached, the creosote, which is contained in tanks adjoining, is admitted at a temperature of about 120 deg. Fah., and, as a natural result of atmospheric pressure, it rushes in and fills the cylinder to within about two inches of the top. Pressure is then applied by force pumps, worked by the steam engine, and in degrees varying with the nature of the goods and the quantity of creosote required to be injected—about 150 pounds per square inch sufficing to force into the body of the timber a quantity (by measurement) of creosote equal to from forty to sixty gallons, according to quality. The time required for the process varies from the weather and other causes, but may be taken at a fair average of eight hours. Every stage of the proceeding being regulated by steam and vacuum gauge, the actual results are ascertained with the greatest nicety.

The demand is extensive for railway sleepers especially, and is not confined in its application to this country; a very large business is done in France, and several of the principal railroad companies are now employing the process, and works have been carried out, or are in progress, for Holland, Prussia, Spain, Turkey, South America and India, where timber thus prepared is found to be thoroughly pretected against the ant. The establishment is capable of creosoting or otherwise impregnating about 1,000 loads of timber per week. They do not, however, confine their attention to the creosote process, as we saw a cylinder just returned from France upon the premises which had just been used for pickling some sleepers for a French railway company *in situ* with sulphate of copper, the reason for the adoption of this material being that in the particular district where the railway was situated it became a cheaper process than creosoting. Messrs. Burt & Co. are themselves manufacturers of creosote at separate establishments, where they distil the creosote in stills holding about 2,500 gallons each. The first product of the distillation is naptha, and light oil used for manufacturing benzole; secondly, the creosote used in these processes, the residue being pitch. We need not say that the whole success of the process depends upon the quality of the creosote employed, for which we have thus a most desirable guarantee.

Having thus generally described what we saw going on, we entered upon the question with Mr. Boulton as to the practicability of rendering wood uninflamable. He said at once that it was perfectly possible, that he had conducted more than one set of experiments with that sense—but that, as in point of fact there was no demand for fire-proof or uninflammable timber for ordinary purposes the matter does not now occupy his attention; he had, however, ascertained that by treating the timber with two separate solutions, the effects of which he has already tried, an absolutely uninflammable material can be obtained at a very moderate expense, and the cost of the preparation would not exceed 15s. per load. As we have elsewhere remarked, while people can insure they will not take constructional precautions against fire, otherwise we should think it well worth the attention of public authorities, as well as private individuals, to ascertain some satisfactory means of rendering uninflammable the timber employed in building, in towns especially, for if all houses were built of fire-proof timber, the number of house fires would be almost indefinitely reduced. Warehouses of course are subject to the same remarks, but then the nature of their contents much affects the nature of the risk.

There are several large establishments of a similar character in London, notably Mr. John Bethell's, but as the process applied is almost precisely similar, the above description may be taken to apply. But his operations appear to be spread over a very wide area; he has five pressure tanks and establishments for creosoting in England, two in Scotland, two in Ireland, three in Belgium, and two in Holland, and from some papers published by him we find numerous instances of the success of the creosoting principle in tropical countries, where the wear and tear upon sleepers was about 1 per cent. in two years, while on the Madras Railway the loss in native uncreosoted timber, from the ravages of the white ants, was 33 per cent. On the 12th May, 1868, Mr. Boulton presented to the library of the Institution of Civil Engineers three pamphlets, dated 1863, 1864, and 1865, being the fourth, fifth and sixth reports of a Commission of Engineers and other members of the Royal Academy of Amsterdam, appointed to report upon the dangerous and destructive ravages of the *teredo navalis* upon the timber used in the construction of dykes round Holland; and Mr. James Town, in St. Helena, the colonial engineer, reports the perfect success of the process in a district "where the white ant abounds," and is terribly destructive.

Mons. Crepin (Ingenieur des Ponts et Chaussees), in a report incorporated in the *Annales des Travaux Publiques de Belgique*, upon some experiments conducted with creosoted timber, from 1857 to 1864, at Ostend, says:

"The experiment, I believe, may now be taken as decisive, and we may conclude that well creosoted fir timber, prepared with creosote oil of good quality, is proof against the attacks of teredo. The wood has retained all its elasticity, and has acquired a density it did not possess in its unprepared state."

Mr. John Coode, engineer-in-chief to the Portland Breakwater, reports in 1857:—"As an instance of the successful application of creosote, I may mention that it became necessary to remove some piles that had been down four years, and fully exposed from above the level of high water to nearly 55 ft. under sea water. There was no sign whatever of attacks by sea worms notwithstanding that we have the *teredo navalis* and *limnoria terebrans* in the bay in great numbers."

Similar reports might be quoted from the Cape of Good Hope, Italy, Germany, Holland, Belgium, and throughout Great Britain on creosoted timber used for railway sleepers.

Another important process still in operation is that of Sir H. Burnett, previously alluded to, but it is of more various application. His solution, the chloride of zinc, injected in a somewhat similar way in a vacuum and under pressure, is used for timber, canvas, cordage, cotton, and woolen goods, for preserving them from dry rot, mildew, moth, and premature decay, and has also the property of rendering wood uninflammable, and, as a curious instance of its successful application, we may quote a report of Mr. Bastable, of the Metropolitan Wood Paving Company:—

"Have had many thousand square yards of wood paving Burnetized (for which they had a license). The Company were obliged to keep a very large stock, and the paving so prepared when closely stowed for any length of time was found to be perfectly free from decay."

On the question of inflammability some experiments were conducted at Portsmouth Dockyard by order of the Lords of the Admiralty, with the following result: "It appears that some of the prepared woods, especially the Canada pine, have resisted ignition into flame to an extraordinary degree." We are of opinion that yellow pine timber prepared in this way might be used most beneficially not only for magazines and lightroom bulkheads, but also for all the bulkheads of a ship.

Burnetized canvas has been used for many years by the Peninsular & Oriental Steam Navigation Company, the Hon. Board of Customs, Trinty Board, several members of the Royal Yacht Squadron, and other yacht clubs, also in India by the East Indian Railway and other companies for the preservation of wagon-covers, &c.

We have thus given an account of the principal establishments which are now in operation in London on an extensive scale. We have recently alluded to Colonel Szerelmy's process, which has been undoubtedly successful, but has not obtained an important commercial position, and we have only to say in conclusion that for all out-door purposes the creosote process, as carried out by the firms above alluded to, appears to be all that can be desired for efficiency and also for economy. While for house building or indoor work, where its smell renders the employment of creosote impossible, Sir W. Burnett's process, or the sulphate of copper solution, appears to be the best at our command; but, as we before said, the commercial demand for fireproof timber for ordinary purposes is not sufficient to make it an undertaking of importance, though we cannot help thinking that it is a subject to which the attention of architects, engineers, and public bodies might be devoted with the greatest advantage.—*Builders' Trade Circular.*

Mileage Ticket.

The recent practice of selling railway mileage tickets necessitates the use of some kind of ticket, so that conductors can ascertain readily how many miles are traveled by the passengers. The best arrangement that we have seen of the kind is one designed by Wm. Mahl, Esq., Auditor of the Louisville, Cincinnati & Lexington Railway. It is a sheet containing ten columns, or coupons of figures representing one thousand miles, the first three of which we copy below, shows the general arrangement:

200				
80	60	40	20	0
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5
6	6	6	6	6
7	7	7	7	7
8	8	8	8	8
9	9	9	9	9
90	70	50	30	10
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5
6	6	6	6	6
7	7	7	7	7
8	8	8	8	8
9	9	9	9	9

100				
80	60	40	20	0
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5
6	6	6	6	6
7	7	7	7	7
8	8	8	8	8
9	9	9	9	9
90	70	50	30	10
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5
6	6	6	6	6
7	7	7	7	7
8	8	8	8	8
9	9	9	9	9

80	60	40	20	0
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5
6	6	6	6	6
7	7	7	7	7
8	8	8	8	8
9	9	9	9	9
90	70	50	30	10
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5
6	6	6	6	6
7	7	7	7	7
8	8	8	8	8
9	9	9	9	9

The full sheet folded in convenient sections, with the name of the person holding the ticket and the distances between the different stations is attached to a neat cover which can be conveniently carried in the vest pocket. It requires nothing but simple addition to enable the conductor to mark the miles traveled. The right hand coupon marks the first hundred miles or any intermediate distance, and when over a hundred miles are traveled the coupon is torn off and the proper figures punched in the next coupon. The figures over the coupons mark the hundreds of miles, and those in the body of the coupons still marking the intermediate distances. Thus: a traveler going 65 miles the conductor punches 5 under 60, then if he goes 20 miles further 5 under 80 is punched, if 40 miles further, the first coupon is torn off, and 5 under 20 is punched on the next coupon, and so on up to any number of miles represented by the coupons. This is a very neat, ingenious and convenient device, and just meets the want. The price charged on the Louisville & Lexington road for their tickets is two cents per mile, and a passenger who buys one of these mileage tickets pays twenty dollars for his thousand miles of travel, and gets rid of the necessity for frequent making of change, and has the evidence of his right to travel constantly in his pocket with his name endorsed thereon and countersigned by the ticket agent; and should he lose his ticket no one else could use it. We think Mr. Mahl's design a very good one, combining simplicity and great convenience.—*American Railway Times.*

Thomson Road Steamer.

We have heretofore given accounts of trials of this engine, and some time ago gave an engraving of one. We now learn that the Grant Locomotive Works of Paterson, N. J., have made arrangements to build these "road steamers" and will soon be prepared to supply parties in this country. We expect to give our readers full illustrations of these engines in a future number. The following summary of the report of officials of the British Government on the efficiency of the invention we take from the Edinburg *Scotsman* of the 8th ult:

A parliamentary paper has just been issued containing certain reports made to the War Department by Mr. J. Anderson, Superintendent of Machinery, and Mr. James Bailey, Assistant Controller, who had been appointed by the War Office to examine Mr. R. W. Thomson's road steamer, and to report as to its advantages as to military purposes. These reports convey a most favorable opinion of the invention, founded upon a close examination, and upon various experiments. Particular attention is drawn to the general facts which the experiments show, and the direction in which they lead. "Up to this time," it is stated, "the world has not seen such immense loads drawn along common roads and up steep inclines, by the expenditure of so small a sum for fuel and labor, and at the same time carried out so easily and smoothly, and with a machine which will, from the elasticity imparted to the construction, enable it to last a long period, and its power of haulage

from the soft elastic rubber tires, enabling the grip taken on the surface of the road to be so extensive—about 240 square inches for each wheel, or say 720 inches in all—render its haulage power of the highest value. We are of opinion, therefore, that its future usefulness over the surface of the globe where no railways exist (which is by far the larger portion) is incalculable. An immense effort is being made at the present time to introduce tramways on common roads. After seeing the road steamer at work, we are inclined to question this policy; it involves a great expenditure of capital, and after all, will be scarcely such a convenient or efficient mode of conveyance as the other. What we most want are good macadamised roads, with small road steamers to run upon them. These engines are easy upon the road and tractable in their management, and are certain to prove formidable rivals when the two systems are brought into active competition. The simple fact, that the co-efficient of adhesion upon the road exceeds one-half the weight of the engine, speaks volumes. This eight-horse power engine has a power of traction over three tons; that is to say it will pull out of a well, by means of a rope passed over a pulley, a weight exceeding three tons. This is a fact that ought to commend itself to thinking men. If the work done in the Bridge of Don experiments are calculated, it will be found that to pull the 15 tons up the steepest part of the gradient, the 12-horse power engine is then exerting a force equal to 100 horses on a level road, reckoning the work of a horse at 33,000 units, and the co-efficient of friction as due to a resistance of 75 lb. per ton on a level road, or a load of 15 tons dragged up an incline of 1 in 8 is equal to 21 tons drawn up 1 in 12. Hence may be inferred the great advantage under which it can be employed at Aldershot, or to follow an army where the roads are good and the gradients moderately easy. Such facts are points of great importance which cannot be overturned. In going up *heavy* gradients, this road steamer, when running on a common road, is preferable to the iron railway or the iron tramway on similar gradients. Upon a level railroad, or on a level tramway, owing to their limited resistance, with a traction of from eight to ten lb. per ton, as compared with 75 lb. of the other, they necessarily have the most decided advantage over the road steamer; but when they have to rise a gradient of, say 1 in 224, the load of a locomotive upon such a gradient is actually doubled, whereas with a road steamer on a common road such a gradient would be scarcely appreciable. It therefore appears to us, after what we have witnessed, that the road steamer is a perfect success, and when introduced, under proper regulations, will be found of incalculable advantage to the public service, and we strongly recommend that one engine and suitable wagons should be ordered for duty at Aldershot, and that a careful code of instructions should be drawn up for its management, in order that its many advantages may be fully developed for army purposes." In concluding, the reporters submit the following suggestions for consideration: "As these engines are made of various sizes, we have experienced some difficulty in determining the particular size to be selected for the present object. We are of opinion that an 8-horse power engine will show the best balance sheet at the end of the year; it is handy to manipulate, and for a country with good roads and moderate gradients, is the one which we think will ultimately be generally adopted. Notwithstanding the above, we yet think that a 12-horse power engine should now be chosen, so as to be prepared for a march out to any part of the country, in addition to the ordinary camp duty. It appears to us that the first engine should be of this description; and we therefore recommend it, in preference to a smaller size, with such an assortment of spare parts as will be sufficient to supply its wants for at least a twelvemonth. With regard to the proper description of wagon which should accompany the engine, we have, after mature consideration, come to the conclusion that a train of three wagons, made on purpose to suit the circumstances, will give the best result. We have arrived at this decision with much reluctance, in consequence of having become acquainted with a new design of wagon, with two wheels, with india-rubber tires, which has been designed by Mr. Thomson, wherein one wagon would be sufficient for the whole load; but taking all things into consideration, we beg to recommend the former, as it is a thoroughly tried system, and sure to answer the purpose satisfactorily, and we herewith enclose a tender for the above articles, and recommend that they should be obtained as early as possible. Lidewise a tender for an 8-horse power engine. with both arrangements of wagon systems; but we prefer the former."

Routes of Cotton Transportation.

From an elaborate and very valuable article in the *Commercial and Financial Chronicle* on the "Cotton Movement and Crop for 1869-70," we take the following description of the routes by which this great product of the South is shipped:

We give below our annual statement of the cotton crop of the United States for the year ending September 1, 1870. Our returns are, we think, more complete than have ever before been presented. Especially would we call the attention of our friends to the details of the overland movement for the year. They show how our railroad system, and its more perfect development in the South, is again changing the course of the Western movement of cotton. Immediately after the war the product of those States sought the Northern mills through the railroads north of the Ohio and hence the amount direct to manufacturers was then large; now, however, an increasingly large portion is seeking the market through Charleston, and especially Norfolk, and the direct overland movement is smaller again. But we refer our readers to a subsequent part of our report for a full explanation of the course of these shipments. It will be seen from the following tables that the total crop this year reaches 3,154,946 bales, while the exports have been 2,178,917 bales, and the home consumption 907,369 bales, leaving a stock on hand at the close of the year of 59,747 bales. The stock of cotton at the interior towns, September 1, 1870, not included in the receipts, is 14,629 bales, against 718 bales last season.

We now bring forward our tables showing the whole movement for the year. The first table indicates the stock at each port, September 1 of 1870 and 1869, the receipts at the ports for each of the last two years, and the export movement for the past year (1869–70) in detail, and the totals for 1868–69.

Ports.	Receipts, year ending Sept. 1, 1870.	Receipts, year ending Sept. 1, 1869.	Exports, year ending September 1, 1870, to Great Britain.	Exports, year ending September 1, 1870, to France	Exports, year ending September 1, 1870, to Other Ports	Exports, year ending September 1, 1870, to Total.	Stock. Sept. 1, 1870.	Stock. Sept. 1, 1869.
New Orleans	1,142,097	794,926	540,603	350,323	196,744	1,005,230	90,696	770
Alabama	306,161	190,091	165,889	15,910	18,049	199,848	6,749	1,094
S. Carolina	446,500	199,073	87,287	1,825	7,993	97,105	1,145	264
Georgia	488,204	387,375	294,770	43,396	17,967	356,133	2,328	989
Texas	296,264	147,817	2,474	122,106	28,514	153,093	4,703	203
Florida	32,874	33,978	.....	.....	.....	.....	211	18
N. Carolina	208,613	140,971	50	.....	.....	50	501	141
Virginia	185,806	140,564*	9,660	.....	.....	9,660	1,077	7,397
Boston*	29,112*	28,103*	329,749	17,737	69,195	413,761	4,698	1,756
New York*	31,809*	28,103*	1,187	.....	490	1,677	1,885	253
Philadelphia*	13,500*	10,407*	7,694	.....	24,668	32,169	1,017	.....
Baltimore*	36,971*	19,454*	.....	.....	.....	.....	.....	.....
Portland*	616*	1,961*	.....	.....	.....	.....	.....	.....
Total this year	2,911,191	.....	1,474,695	506,45	357,772	2,178,917	59,747	13,344
Total last year	.....	2,100,428	980,677	324,527	293,816	1,448,020	.....	.....

*These figures are only a portion of the receipts at these ports which arrive overland from Tennessee, &c. The total receipts at New York, Baltimore, Boston and Philadelphia, for the year ending August 31, 1870, are given in a subsequent part of this report.

By the above it will be seen that the *total receipts at the Atlantic and Gulf shipping ports* has been 2,911,121 bales, against 2 100,428 bales last year. If now we add the shipments from Tennessee and elsewhere direct to manufacturers, we have the following as the crop statement for the two years:

	Year ending Sept. 1—1869–70.	1868–69.
Receipts at the shipping ports.....bales.	2,911,121	2,100,428
Add shipments from Tennessee &c., direct to manufacturers	153,825	258,611
Total	3,064,946	2,359,039
Manufactured South, not included in above.....	90,000	80,000
Total cotton crop for the year, bales.....	3,154,946	2,439,039

The result of these figures is a total of 3,154,946 bales as the crop of the United States for the year ending August 31, 1869, against 2,439,039 bales as the crop for the previous year.

OVERLAND MOVEMENT.

The point in crop reports, upon which the public has always desired light, has been in the overland movement. Ever since we first issued an annual statement it has been our effort to make up these figures from railroad returns. This year, however, we not only follow the same system, but, in order that proof of the correctness of these figures may be in the possession of our readers, we give by request the details upon which our conclusion is based.

It will of course be admitted that no cotton can come overland to the North from the South except by crossing or passing the Ohio, Mississippi or Potomac river. Hence, if we obtain returns which show each bale received on the Mississippi north of Cairo, and on the entire north side of the Ohio for the West, and on the north side of the Potomac for the East, we must have reached every part of this movement. Pursuing this plan, and beginning at the Mississippi, we find first that the receipts for the year at St. Louis have been 18,298 bales. This cotton passes to the north over railroads entering at that point, and is all that is taken from the Mississippi by these roads. Other than this no cotton (not including local consumption) passes up the Mississippi except what reaches the Illinois Central Railroad. A full return from that railroad shows that it has taken from Cairo and Southern Illinois, and carried north, 21,567 bales during the year. Following up the north bank of the Ohio, the first point of departure we find to be at Evansville, and a detailed return made to us of the Evansville & Crawfordsville Railroad shows that they have taken from Evansville for the North during the period in question 40,371 bales. Passing on to the next lines of railroad, which are opposite Louisville, we have first the Louisville, New Albany & Chicago. This road has carried no cotton. Next is the Jeffersonville, Madison & Indianapolis Railroad, including the Madison branch. The returns of that corporation give 106,506 bales transported. The Ohio and Mississippi branch (opened in May) reports that it has carried none. From Louisville to Cincinnati there is no railroad running north from the river which has carried any cotton except the branch of the Jefferson, Madison & Indianapolis road to Madison, included above. At the city of Cincinnati receipts for the year not otherwise counted are 146,424 bales. As to the quantity of cotton shipped to places above Cincinnati without touching at the latter city, it is not possible to give an exact statement; but from much information in our possession in regard to that particular movement we are enabled to make an estimate which must necessarily be very close to the truth. The amount shipped in this manner is at best but a small proportion of the Ohio River movement, as nearly all cotton for points high up on the river is re-shipped at Cincinnati and included in the receipts at that port. For instance, a prominent mill at Pittsburgh informs us that they purchased during the year 2,438 bales at Memphis of which only 63 bales were shipped through direct to Pittsburgh by boat, and the balance was reshipped at Cincinnati. On the basis of this and the other returns we have received, we estimate the total shipments from points below Cincinnati direct to points above that city on the Ohio River, together with the consumption of such mills as are located near the river and use cotton landed directly at their wharves, at 17,250 bales. Turning now to the east of the Alleghenies, it will be found that there is no cotton transported overland—it is all reported at the Virginia ports. The Orange & Alexandria Railroad, the only through line connecting both with the South and Southwest, reports that not a bale of cotton has passed over their road; and the less important road from Richmond to Washington, *via* Acquia Creek, makes a similar report. A summary, then, of the figures given above produces the following result:

Receipts for the year at St. Louis.....	18,298
Carried North over Illinois Central Railroad	21,567
" " Evansville & Crawfordsville Railroad.....	40,371
" " Jeffersonville, Madison & Indianapolis Railroad	106,506
Receipts at Cincinnati not otherwise counted	146,424
Shipped to points above Cincinnati without touching at Cincinnati, and consumed by mills adjacent to the river, &c...	17,250
Total overland movement.....	350,416
Deduct amount received overland at New York, Boston and Philadelphia, &c	196,591
Total direct to mills.....	bales. 153,825

It may be asked why this movement *direct to the mills* is so much less than last year. A moment's examination will explain it. First, the movement by railroad to New York is 31,292 bales more than in 1868–9. Second, the movement to the South from Memphis alone is over 17,000 bales more. Third, and chiefly because Western cotton is seeking the market more and more through Norfolk and Charleston, the movement in that direction being largely in excess of the previous season. For these reasons our returns show a smaller movement direct to the mills than was generally expected.

A Model Belgian Iron Works.

John Cockerill, an Englishman established the works at Seraing, in 1817. He started in a small machine shop in a very small way; but the works have gradually grown till they now occupy the whole of the extensive gardens of the ancient bishops of Liege, the present offices having been the fine old palace, so that it makes a noble front for the works, which are situated on the banks of the Meuse. This company carry out the whole operations, from the raising of the coal and minerals to the turning out of the finest engines, bridges, iron-clad ships, &c. The general director is M. Sadoine. The area covered by the works is 90 hectares, one-eighth of which is entirely taken up by buildings. The number of persons employed in 1867 was 7,227. They pay annually for salaries 6,660,000 francs, and employ 156 steam-engines, of the collective nominal horse-power of 2,843. The yearly amount of work constructed is valued at 25,000,000 francs, and the quantity of fuel consumed is computed at 220,000,000 kilogrammes. The collieries employ 2,175 persons, and steam-engines of 628-horse power. There are four separate places of extraction, and eight pits or shafts used for raising the coal, ventilation, and the descent and ascent of the workpeople by means of the fahrkunst, or man-engines. From these pits are raised 260,000,000 kilogrammes of coal. They employ 195 men and women to convert coal into coke, and steam-engines of 87-horse power. There are five lots of coke ovens (of two classes), six stamps or pounders, two washing machines, and eight steam drying furnaces, for preparing the coal before it goes to the ovens; 80,000,000 kilogrammes of coke are produced annually.

In the mines are employed 875 operatives, and steam-engines of 224-horse power. There are thirty places where the mines are extracted, in the provinces of Liege, Namur, and Luxembourg, and the total amount produced yearly is 146,000,000 kilogrammes. There are five blast-furnaces, with steam-engines of 548-horse power, and employing 288 persons. The blast-engines ars very powerful, and produce a pressure of blast equal to 3¼ lb. to the square inch. The boilers and hot-air furnaces are heated by the waste gases. The annual produce of iron amounts to 50,000,000 kilogrammes. In the foundries 256 workpeople are engaged, and the engines are of 32 horse power. There are eight cupolas, and 800,000 kilogrammes of moulding boxes. They have two separate buildings for core making and drying; 5,000,000 kilogrammes is the weight of castings turned out annually. In the iron works—that is, the mills and forges—985 operatives are engaged. The steam-engines are of 532-horse power. There are 68 reverberatory furnaces, 13 rolling mills, and 5 hammers. Plates and sheets, merchant iron, and specialities are produced yearly to the total weight of 10,000,000 kilogrammes, and rails to the amount of 25,000,000 kilogrammes, making in all 35,000,000 kilogrammes. The steel works employ 191 workpeople, and steam-engines of 520-horse power. There are 2 large Bessemer converters, 5 ordinary furnaces, 24 casting furnaces, 15 reverberatory furnaces, 7 hammers of from ½ to 15 tons, 1 rolling mill of very large dimensions, and 2 rolling mills for railway wheel tires, fitted with all necessary hydraulic apparatus. The annual production amounts to 7,500,000 kilogrammes of wrought and cast steel, steel rails, tyres in steel and iron, and steel castings for machinery.

In the iron forges, engine and machine shops there are 1,184 persons employed, and engines of 224-horse power. There are 23 reverberatory furnaces, 13 steam hammers, 230 lathes, 18 slotting machines, 84 planing machines, 90 drilling machines, 5 machines for forging nuts and bolts, and 3 hydraulic presses. The quantity of engines and machines constructed annually amounts in weight to 7,000,000 kilogrammes. The boiler and bridge yards employ 573 persons, and engines of 42-horse power. There are 18 drilling machines, 35 punching machines, 7 sets of rollers for bending plates, and 20

shearing, planing, multiple drilling, and riveting machines; 4,000,000 kilogrammes of steam boilers, bridges, etc., are made annually. In the Antwerp shipbuilding yard 319 persons are engaged. There is one steam engine of 8-horse power, special docks for all classes of marine constructions, shipbuilding sheds of glass, rafts and boats, machines for masting, stocks, and launching cradles, both for sea-going vessels and river boats. The weight of marine constructions made yearly amounts to 2,000,000 kilogrammes. From 75 to 800 operatives are employed in the St. Petersburg yard, and it is furnished in every respect similarly to the Antwerp one. The annual productions weigh 1,500,000 kilogrammes. There are 111 managers and clerks belonging to the establishment. The area of the work is divided in the following manner: The Seraing works cover 72 hectares, the Antwerp yard 5½ hectares, that of St. Petersburg 1⅛ hectares, and their own mines 11 hectares. Independently of the above they hold under Government for getting coal 195 hectares, and for getting mine 3,500 hectares.

They have constructed at the Seraing works 1,687 steam engines of from 4 to 600-horse power for industrial applications, 675 locomotives of all sizes and systems, 11,650 machines forming complete works and parts of works, for raising and reducing coal and minerals, the working of metals, for construction, sugar factories, the making of ice, paper making, weaving, bridges, suspension bridges, &c.

The yards of Antwerp and St. Petersburg have furnished for navigation 174 ships, river boats, pilot boats, floating lights, dredgers, transports, packets, floating docks for frigates of the largest size, and iron-plated monitors. The two armour-plated monitors with tower, propellers, and machines for towers, ventilators, gun carriages, centrifugal pumps and accessories, supplied to Russia in 1864, having been ordered on June 18, 1863, were sent for finishing to St. Petersburg in October, 1863, and booked to the Imperial authorities, fully equipped and armed, after trial, on June 13, 1864, having been commenced and completed ready for service in less than twelve months.

The works of Sir John Cockerill & Co. can furnish annually 50 locomotives of the first class, 70 marine engines of from 4 to 1,000-horse power, 1,500 lots of mechanical constructions, 3,000,000 kilogrammes of bridges and like structures, 14 ships and boats, taking 5,000 tons of material besides coal, coke, minerals, castings, wrought iron, rails, and steel in the quantities before mentioned. Every department is kept strictly apart, so that each one seems to belong to a separate proprietor.—*London Mining Journal.*

The Unit of Length.

The battle of the Standards is over, and we may say the Metre has gained the victory. The need of a new system of weights and measures to amend the strange diversities which disfigure our practice being admitted, the question has once more been started—Should we once for all found our system on a natural basis? The pendulum vibrating seconds in a certain latitude, was long ago proposed as a universal basis of linear measure, and the House of Commons somewhat countenanced it years ago, by prescribing that the length of the yard shall be determined by the length of the second s pendulum. But the action of gravitation, on which terms of the vibration depends, is subject to so many variations and disturbances, that the quantity sought cannot, even on the same spot, be absolutely the same at all times. The real length of a normal pendulum is almost unattainable, so limited is our knowledge of the force of gravity on land and at sea. A more certain basis for a natural unit has been found in the polar axis, the length of which, according to Sir John Herschel, bears a close relation to our imperial inch, and has the advantage of avoiding the many causes of error resulting from the physical peculiarities of the countries through which any measured arc may happen to pass. But are our physicists agreed as to the real length of the polar axis, and would it be worth while to make any alteration in our weights and measures for the sole purpose of attaining some scientific correspondence between the unit in use and a unit founded on nature?

The advocates of the metre rest their arguments on a much broader basis. They do not assert that the metre is absolutely and mathematically the ten millionth part of the quadrant of the earth, they know that the meridians of places differing in longitude are not all precisely the same length; and they admit that were we now to make a new measurement with our better instruments and more extended information, we might attain much greater accuracy than was arrived at by the French philosophers at the end of the eighteenth century. What commends the metre above any other unit, is the fact that it is already a cosmopolitan unit, widely recognized, and in general use among many nations; and that whilst other units remain as philosophical abstractions, the metre is the basis of a system, not only perfectly complete, homogeneous, and scientific, but simple and practical in all its parts. Any slight error in the determination of the metre, is more than counterbalanced by the extreme simplicity, symmetry, and convenience of the metric system; and not the least of its recommendations are, that the unit of linear measure applied to matter in its three forms of extension, viz., length, breadth and thickness, is the standard of all measures of length, surface and solidity; and that the cubic contents of the linear measure in distilled water at a temperature of great contraction, furnished at once the standard weight and measure of capacity.

When we said that the battle of the Standards is over and that the Metre has gained the victory, it was meant that, for practical purposes, all opposition to the introduction of the metric system has been abandoned, and that Parliament and the Government are now left to introduce it in such a way and at such a time as may be found at once practicable and satisfactory. The use of the metric system has been legalized for the last half dozen years, but it was not till quite lately that the whole question was submitted to the calm deliberation of a Royal Commission. The Standard Commissioners, who included among their members the Astronomer Royal, the President of the Royal Society, and the late Master of the Mint, considered the question of the introduction of metric weights and measures, in any form *ab initio*. And after careful examination they gave their verdict in its favor in the following terms:

"Considering the information which has been laid before the Commission—

"Of the great increase during late years of international communication, especially in relation to trade and commerce;

"Of the general adoption of the metric system of weights and measures in many countries, both in Europe and other parts of the world, and more recently in the North German Confederation and the United States of America;

"Of the progress of public opinion in this country in favor of the metric system as a uniform international system of weights and measures;

"And of the increasing use of the metric system in scientific researches and in the practice of accurate chemistry and engineering construction;

"We are of opinion that the time has now arrived when the law should provide, and facilities be afforded by the Government, for the introduction and use of metric weights and measures in the United Kingdom."

The Commissioner further recommend that metric standards, accurately verified in relation to the primary metric standards at Paris, should be legalized; that verified copies of the official metric should be provided by the local authorities for inspectors of such districts as may require them; and the French nomenclature, as well as the decimal scale of the metric system, should be introduced in this country. The Commissioners, whatever might have been their predilections, could not resist the fact that the civilized world pronounced itself for the metre, and they sanctioned its legalization. What is to be regretted is that they stopped there. Since the complete substitution of the metric for the present practice is now practically certain, would it not be much better to prepare for the change and carry it into effect as speedily as possible? No advantage can come from a policy of indecision, and we trust that the Legislature may adopt a more definite course than the one sketched out by the Royal Commissioners. Let it not be imagined that the people will give themselves the trouble of learning the new system, however beautiful and easy, so long as its use is not absolutely necessary. With all the desire of the teachers to introduce it in the schools, they find that they cannot teach the old and the new tables. They cannot afford the time. A compulsory measure is the only method of dealing with the question.

The Warden of the Standards being now employed in procuring Metric Standards, it may be well to add that the mode of constructing them, either from the original Metre at the Archives, or from the copy at the Conservatoire des Arts et Metiers, has been much debated. The International Statistical Congress, held at Berlin, decided "That the care of preparing and putting into execution the regulations to be followed in the construction of the standards, and of the system itself, should be intrusted to an International Commission, which will also see to the correction of the small scientific defects of the system." The International Geodesical Conference, held at Berlin in 1867, decided: "In order to define the common unit of measures for all the countries of Europe, and for all times, with as much exactness as possible, the Conference recommends the construction of a new prototype European Metre. The length of this European Metre should differ as little as possible from that of the Metre of the Archives in Paris, and should in all cases be compared with the greatest exactness.

"In the construction of the new prototype standard care should be taken to secure the facility and exactness of the necessary comparisons." And "the construction of the new prototype metre, as well as the preparation of the copies destined for different countries, should be confided to an International Commission, in which the States interested should be represented." Since then, the Imperial Academy of Science of St. Petersburg has taken the matter in hand, and a committee of the Physico-Mathematical class, consisting of MM. Struve, Wild and Jacobi, has made a report on the subject, observing that the standard metric weights and measures of the various countries of Europe and of the United States differ by sensible though small quantities from one another. They expressed their opinion that the continuation of these errors would be highly prejudicial to science. They believed that the injurious effects could not be guarded against by private labor, however meritorious, and they recommended that an International Commission should be appointed by the countries interested to deal with the matter.—*Nature.*

Centralizing Motive Power.

BY J. RICHARDS, M. E.

The most important element in human industry is the employment of the forces of nature to produce effects beyond the scope of manual effort. To convert the crude materials of nature into such forms as will give us shelter, food, clothing, comfort, and pleasure, is the business of human life. If the reader will glance around him, no difference where he may be, I doubt whether he will be able to find a single article, great or small, of human production, that does not in some degree owe its origin to the employment of physical force; and perhaps not one that is not, directly or indirectly, the product of steam power. It forms an interesting problem. The paper on which we write, the pen, even the modern pen stem, the paper on the walls, every nail, the clothes we wear, the buttons, even the gas that furnishes the light, can be traced back to the steam engine, or other motive power, that has been the main agent in its manipulation from the crude materials of nature.

It would be, further, a safe proposition to say that, next to human life itself, the great auxiliary of natural forces is to us the most important of earthly matters, so intimately are they connected with our civilization and welfare. A thing then so important as motive power should command our continual and earnest consideration. Its economy and safety should be the most important of all questions in science. Whatever contributes, even in a minor degree, to its improvement should be recognized as of the highest precedence over other discoveries and inventions in the rank of its great importance.

The improvement of the steam engine has, no doubt, of all other mechanical subjects, received the greatest amount of scientific attention, but it has, without doubt, been too much confined to various modifications in its mechanical construction with a view to special adaptation, and such economy as could be attained by improvements in steam generators, furnaces and valve movements. The greater question of *aggregated* or *segregated* sources for power has not (at least in this country) received much attention. The question of localizing and distributing motive power bears directly upon the two greatest questions involved: the cost of power and its safety. As affecting these conditions, it is proposed then, in a brief way, to present some views as to what might be gained by central'zing motive power in manufacturing districts and distributing it to be used by the manufacturers as we do gas or water. The first thing, aside from physical practicability, to be considered, is a proper medium for transmitting accumulated force in a way to be graduated, measured, and carried to a distance. This medium nature has provided in our atmospheric air, freed from a single fault, in fact impregnating our systems and essential to life. It is without money and without price. Governed by the laws of gases, it has all the properties and fulfils all the conditions of steam for a common engine, except that of lubrication. It is not explosive, it is free from danger; after use there is no residue, it can be discharged in any room, conducing to its comfort in either winter or summer. It is so subtle that it can be carried to any distance through innumerable angles without diminishing materially the original force; and we must consider it strange to see the attempts recently made, in Germany and elsewhere, to transmit power by means of ropes and pullies, through long distances, instead of using compressed air for the purpose. In contrasting or in considering different means of transmitting power to a distance, we find as the most important conditions: first, the loss by friction; second, durability; and third, first cost—we mean, of course, after demonstrating the practicability. Air has already been extensively employed for propelling machinery and in raising liquids, after being compressed by mechanical means. Its flow through pipes and the valves of engines and pumps has been demonstrated, and is, as we believe, determined by fixed formulæ. Machinery for compressing it, is well known either as the blowing engine or the hydraulic apparatus; so that perhaps the only things to be considered in suggesting a system of concentrating power at one point and distributing it to consumers, are the pipes for conducting it, and the saving that would be effected by such a system.

The difference in cost of generating 1,000 horse-power by a single condensing engine, favorably located, when contrasted with the cost of producing the same power with forty non-condensing engines with 25 horse-power each, is, we will assume, as two to one, an assertion that is undoubtedly a safe one, when we consider the cost of attendance, room, wear, and fuel. Supposing that the cost of generating this power is in one case $50 per horse-power per annum, and in the other $100 per horse-power per annum, we have a saving representing the sum of $50,000 per year in forty of our shops, supposing the amount of power used to average 25 horse-power each; or should we assume that twenty steam engines of 50 horse-power each, would cost proportionately compared with the large one of 1,000 horse-power, we should have this saving represented in twenty manufacturing establishments using that amount of power.

This sum would lay conducting pipes through almost any of our manufacturing districts, to the extent of 1,000 H. P., and we would in a single year pay for the piping, and in another year pay for the compressing machinery, while either would last for twenty years.

The saving in cost, although no doubt the question that would have most to do with the inauguration of a system of centralizing and distributing power, is but one out of many involved. With a "pneumatic main" laid through the streets of our manufacturing districts, and each manufacturer taking off his power through a meter, we would gain not only in economy and convenience over local steam power, but obviate nearly all that is objectionable in it. The danger from boiler explosions would be gone. The smoke from steam furnaces would be avoided, the heat and danger from fire would be avoided. The room would be saved, the water rate would be saved. The engine would not freeze in the winter. The cost would be as the amount of power used, which could be varied with the state of business; or a change in the capacity of motive power could be made at a trifling cost.

May we not look for the next great innovation in motive power to consist in centralizing it and distributing it by means of pneumatic apparatus?—*Journal of the Franklin Institute.*

—The Watertown *Republican* says: last week, a cattle-dealer shipped twenty-five head of cattle from some point north of Portage, on the Milwaukee & St. Paul Railway. On the arrival here of the car supposed to contain the cattle, judge of the surprise of the dealer to find only six of the animals in the car, leaving nineteen to be accounted for somewhere on the route. Procuring a hand-car, the cattle dealer made search for his lost stock, and they were all found between here and Lowell Station, about ten miles from this city, all right, and none the worse for the dumping they had got. It appears that by some means the car-door became opened, and through it they escaped.

Improvements in Railway Construction.

One of the greatest branches of civil engineering—we use the adjective in its literal not in its technical sense—possesses an aspect in the present day which is the very antithesis of some departments of modern construction for purposes of warfare. While, on the other hand, we see each year larger ironclads laid down on the stocks, and bigger cannon constructed with which to arm them, a remarkable change is coming over the dreams of the older railway engineers, and if ever a technical question promised searching investigation in all its bearings surely the question is railway engineering. While one class of engineers are emulating each other in building or proposing big guns or big armour-plates, many of their brethren, whose labors are to promote commerce instead of improving munitions of war, are devising every conceivable scheme to diminish the cost of railway construction.

When the railway principle was first embodied in anything like a national line we got the Great Western with a gauge of 7 feet; even at that early period, however, in the system a powerful opposition was made to the adoption of an arrangement that demanded so large an outlay. Since then every effort has been made to render the principle of traction on rails subservient to the needs of commerce in less expensive fashion than even the cheapest existing railway exemplifies. The cost of the mere rails themselves, although an important feature in the maintenance bills, is one quite apart from those heavier outlays represented in huge earthworks and colossal bridges. So energetic are these efforts that nearly every conceivable gauge is proposed, from the existing and popular 4 feet 8½ inch gauge down to what we must, at the risk of being accused of perpetrating a bull, designate as no gauge at all, and represented in a patent lately secured in which a single rail is intended to be employed.

Commerce, to benefit all its votaries in a like degree, must have uniform facilities for its operations. It is to no purpose that one man has as valuable goods to sell as another, unless he can bring them to market as quickly, in as good condition, and at as small an outlay. Perhaps the most valuable commodity since the advent of railways is time. Never was there a period when the "first come first served" maxim obtained so completely as the present; this question of time affects all alike, because the most rapid commands all other transactions. The necessities of this principle apply to colonies as well as to old countries, to outlying provinces as well as to leading centres of commerce, and until colonies are supplied with the same, or nearly the same, means of intercommunication, they cannot deal on equal terms with such countries as already possess them.

When the railroad question is considered in its bearings as provided for the purposes of new countries it contrasts favorably even with common roads. This may at first seem a startling assertion; nevertheless it is a true one. A road, in the generic sense of the expression, is simply a device by which a load is sustained and which admits of that load being moved over it with a certain tractive force.

Examining the power to sustain, we find it is simply a question of area. If a wheeled carriage with tyres (say) one inch and a half wide is placed in soft mud, it at once sinks till a firmer bed is reached; if it be set on planks laid over the surface of the mud, then it rests secure because of the larger area. This appears trite, but nothing is so trite as an established principle, yet without principles engineering would perish. Now a rail is simply a girder, neither more nor less; if, then, we can lay along the ground a succession of girders properly provided with base area proportionate to the nature of that ground and the magnitude of the load to be borne, we have the railway principle at once embodied. The common road is another affair; in it we merely labor to thicken or stiffen the mud to such consistency that it may be able to prevent the wheels sinking therein; but in moving the carriage over this road there is no provision to secure the progress of the wheels in a straight or a uniform direction; therefore the road must have large margins for lateral deviation.

The leading reason why the railway principle developes so slowly at present in new countries, and even in thinly populated districts in old ones, is that it is so persistently regarded as the exponent of the most advanced civilization, and, consequently, we fall into the habit, when thinking or discussing questions of railway construction, of picturing to our imagination palatial stations, 40-ton engines, saloon carriages, and a speed of fifty miles an hour. Happily we are beginning to break through this narrow view of a great principle, and are learning to take a more extended one. Many a clever engineer would be startled if told that in certain places, and those the least of all adapted for a railway according to human wisdom, are the places in which Nature has herself provided such facilities that a few men with hatchets can in three or four weeks construct a length, to be measured in miles, of a road to all intents an excellent railroad capable of conveying goods, and, if a little additional care be exercised, passengers also, with speed and safety. An example of such a line is to be found in Italy, where the wood lumberers, as the Americans would call them, lay down trunks of trees side by side longitudinally in the direction of the road; if on the ground, well and good; if a precipice intervene then shallow steps are cut in the face of the cliff and transverse bars are laid projecting out like brackets, and sustained at the outer extremities by thrust members, roughly recessed into the horizontal cross timber at one end and into the face of the rock at the other. Then on these the trunks of trees are laid longitudinally, as on the ground, and so arranged that the small ones are at the centre and the others increase in size to the sides of the road. This is simple enough, but something is still wanting to complete the line. The next process is to throw water on this timber roadway, which speedily freezes; then more and yet more water till a stout veneer of ice is formed, and which, from the large trees being outside, is in a hollow or depressed in the centre of the cross section of the line. Where there is a curve an additional stick is placed as a guard rail outside and resting on top of the outer stick. Here, then, the Italian lumberers have provided a regular tramway, down which they send their timber balks, the speed being sometimes as much as twenty miles per hour, the line throughout being on a considerable inclination from the woods at the base of the Alps down to the valleys below. The timbers being started at the one end slide like a ship when launched from the stocks right away to the other end. From this we percieve that it is possible to embody a principle without elaborating a mass of scientific matter, which, however valuable in other circumstances, is inapplicable to railway-making in the bush.

As one example of how our habitual method of regarding the railway question cramps its application in a rough way is the question of gauge. To this day, whenever a novelty in railroad construction, apart from mere questions of permanent way, is under discussion, the word gauge is as sure to turn up as King Charles's head did in Mr. Dick's memorial. Even the roughest tramway is laid to a gauge, very properly of course, where the doing so does not involve any particular point of trouble; but did any enterprising individual ever yet think of whether a line might be made without the presence of a skilled supervision to see that the rails were of a perfectly uniform distance apart? This necessity for care in laying the rails is one obstacle, or is made one, to the construction of rough railways. Another perhaps as serious grows from it, and is found in the necessity for, in some sort, special vehicles. Now there is no reason why this last evil may not be greatly diminished, and we would suggest the principle of making one of each pair of wheels to run loose on the axle and to have liberty of movement on it in the direction of its length; of course the wheels would need double flanges, but it is as easy to have two as one. With vehicles of this nature a line with light rails could be laid down in places where timber was at all plenteous with great despatch, and at less cost than a macadamised road could be constructed, while at the same time furnishing the germ of what as the country progressed could be gradually elaborated into a first-class railway. Doubtless, the loads on such a line should be light, therefore they could but at first be the means for any wheeled carriage drawn by a horse to pass over, and be improved afterwards.—*Mechanics' Magazine.*

Railroad Traveling in France.

A correspondent of the *United States Railroad and Mining Register* writes as follows of the peculiarities of traveling on French railroads which most strike the American traveler:

A traveler in passing post haste through France from Brest by Paris to Marseilles, if he be not especially a railroad engineer, has little chance to notice many railroad matters that are different from what is seen in America. He cannot, however, but be struck by the size and uniformly good arrangement of the passenger station houses, and by the fatherly care that is taken not only for the general comfort of the passengers, but that they be sure to get into the right train. Plenty of time, however, is taken for this care, and if you have baggage you must bring it to the station at least fifteen minutes before the train starts; otherwise you may have the mortification of finding the gates closed and of seeing the train stand five or ten minutes and the officials with nothing to do, while you have to turn back and wait for the next train. Ten minutes for checking the baggage is in like manner sometimes exacting at the foot of Cortland street, in New York, but without any apparent rule. But in France the baggage is not so speedily checked as with us; it is carefully weighed, a numbered label is pasted on, and a paper ckeck with the same number, and bearing in manuscript the weight of the baggage and price paid for it, is given. The price paid is at least two cents, and besides that a small amount for every pound over the allowed amount of about sixty pounds. The tickets at the Brest station are sold by a woman, who seems to be as careful and at least as quick as male ticket sellers are, and as safe from harm behind her little window as any woman need wish to be. All along the road the gates which are invariably closed as the train passes the railroad crossings, are watched more often by women than by men, motherly-looking women that seem to have just stepped out from the little cottage close by and stand looking seriously at the train, with a little tarpaulin hat sitting jauntily on their head and a club held upright in front of one shoulder, and, if it be before daylight of a December morning, with a lantern in one hand. In spite of its being in gay France, this is not so gay and charming a sight as the much rarer American one that was seen one fair morning in Northwestern Pennsylvania, on the Philadelphia & Erie Railroad, when a blooming lass waved a signal flag and at the same time smiled brightly on the engine driver as the train passed.

The American traveler in France as he bounces along in the train wonders if these are the European railroads that are boasted of as so smooth in comparison with our American roads. The cars are so short and light that there is much more violent motion in them than in ours, although our roads be rougher. The first-class cars, however, in France are better cushioned than ours, and on the whole it is quite possible to take a sound nap in them in spite of the jolting; especially if you have been kept awake all night by a late landing at Brest, and if you have to yourself, as is very likely, a full quarter of a compartment intended for eight. The division of the car into such small compartments seems to shut out much of the noise we have in our cars, and talking is quite possible. Of course it is impracticable in winter to have a stove in such little compartments, and the difficulty is very satisfactorily obviated by putting under the passengers' feet a metallic box full of hot water. There are two such boxes for each compartment; they are perhaps three feet and a half long by eight inches wide and two inches and a half thick, of stout sheet metal covered with thin carpeting; and they are changed about once in two hours, at stations where there are long stops for fuel and water. These boxes have the avantage of warming the feet, while the ordinary out-door clothing keeps the rest of the body warm. In America the head and body are often overheated in the cars while the feet are freezing. The new American plan of a hot water or steam pipe under the feet is very good, except that by want of care the heat is sometimes intolerable, and there is no escaping from it. Might it not easily be so arranged that each passenger could turn the steam on or off from his branch of the pipe to suit himself?

The refreshment places along the French railroads are admirably served and at reasonable prices, and plenty of time is given for a good meal. Moreover, as the time comes near its end, a man stands at the door and calls out now and then how many minutes of it are left, so that there is no needless hurry. It is said that on some roads and trains time is saved by letting the passengers take the dinner in the cars from one station, and send back the plates and other table furniture from another station; but there are no "hotel cars" where the meals are cooked as well as eaten.

During the long stoppages the car wheels are tested by the stroke of a hammer, as with us (except in the South); and either then as you walk the station platform, or as you look at the cars on side tracks in entering or leaving a station, you notice one great difference between the French and American car wheels. The French car wheels are made of wrought iron, of strips of thick boiler plate bolted together, and with spokes, and look much lighter than our big cast iron ones; and to the unpracticed eye look weaker, but support freight cars that carry nearly the same weight as ours. Of course wrought iron can stand shocks much better than cast iron of the same weight could. The train comes to a stop and starts more gently than ours often do, without those disagreeable jolts and shocks; and that is because the cars are well buffered. It seems strange that this precaution, so simple, should be so neglected in America; for it must be a saving in the wear and tear not only of the passengers, but of the machinery. The French train moves perhaps more steadily, at a more uniform rate than our trains do; and this may partly be because in France as in Germany the engine driver is kept well posted as to the direction of the grade and its steepness, so that he can regulate his steam accordingly and spare both the machinery and fuel. All along the road at every change of grade is a post with a small sign board pointing towards each grade, and bearing figures that show the steepness of it—for example, the number of feet in a thousand. Of course our engine drivers get in time a certain acquaintance with their road; but it must be comparatively a rough one. The system by which the train is managed and the tickets taken up is mysterious to a new comer, and seems quite too complicated to be fathomed in one journey.

Brave Act of an Engineer.

Chambers' Journal tells the following incident of nerve on the part of an English locomotive engineer: An engine left standing at a station was "thrown out of gear," as it is called—that is, its machinery was so purposely deranged that it could not move in either direction; but, from this having been imperfectly done, it at last got under way, very slowly at first; But the regulator being jerked open, it soon attained a terrible speed, which was all the more alarming, as it had started on the down line, and was running towards London. The effect of this, of course, would be that it must, sooner or later, run headlong into the first down train, and there seemed no possibility of averting a more awful accident than had ever yet taken place. A ballast driver, however (one who has charge of the train of earth trucks which convey the material for making the lofty parts of new lines, and also remove the soil from the cuttings), saw the engine running without a driver, and, with wonderful nerve, left his siding, and at full speed dashed after the flying locomotive. This was desperately hazardous, for, had they encountered a train, he would not only have been killed, but, by the presence of his engine, would have rendered the inevitable accident more fearful—the reader, of course, understands that he, too, was running "up" on the "down" line. However he caught the runaway, and leaping from his own engine on to the tender, he reversed both engines and ran back to the station—some six miles—as swiftly as he could, arriving there safely, just in advance of a passenger train."

Compressed Water as a Lubricator.

A correspondent of the *Iron Age*, who lately asked for a remedy for, or rather a prevention of hot boxes, has received the following prescription:

"The *modus applicandi* is as follows: The lower half of the socket, in which the axle runs, to be cut in grooves, communicating by an aperture in the middle with a tube through which the water under a heavy pressure is introduced into the box. The effect of the pressure is at first to elevate slightly the axle, opening a passage for the escape of the compresssd water, which, released from pressure, loses its power to sustain the axle. The axle consequently returns to its position, confining, however, more or less water. After one or two movements the axles settles in position, which allows the water to escape, but only in a film of unappreciable thickness. Thus a liquid bed is formed, with so small a resistance to revolution that it is said a slow turn given by hand to a wheel will be maintained for many minutes without perceptible retardation. Just how this arrangement could be made applicable to railway cars, except at too great an expense to suit the views of managers, does not appear. The theory is correct, no doubt, but the practical part we fear 'will not hold water.' Amongst others, we have, however, an invention which we are are assured 'will, without doubt, create a new era in the lubrication of car axles.' When the 'new era' begins, we will inform your readers that the chronology thereof may be noted."

General Railroad News.

OLD AND NEW ROADS.

West New Hampshire.

The managers have decided to commence the construction of this road immediately. It is along the Connecticut River, mostly on the New Hampshire side, but begins at South Vernon, in the extreme southwest corner of Vermont. The section surveyed extends northward to the island opposite Brattleboro, Vt.

Long Island Railroad.

There is to be an extension of the Hicksville & Northport Branch of this railroad from Northport eastward along the north shore of the island about fifteen miles to Port Jefferson. The people on the line have subscribed $100,000 for the extension, which is to be made by an independent company, and the Long Island Company will guarantee $100,000 of bonds for it.

Grand Rapids & Indiana.

This road, which, when completed, will be one of the greatest of the north and south lines, and will be to Michigan something like what the Illinois Central is to Illinois, is now completed for 200 miles north of Fort Wayne, to a town called Paris, five miles north of Big Rapids, in Mecosta county, Mich., about 50 miles east and ten miles south of Pere Marquette, and nearly due east of Sheboygan, Wis. An extension 75 miles further north will bring it to Grand Traverse City, and thence the distance is 85 miles north by east to the Straits of Mackinaw. Regular trains will run between Fort Wayne and Paris, passing through Sturgis, Kalamazoo, and Grand Rapids, by the 1st of October. In connection with the

Fort Wayne, Muncie & Cincinnati Railroad,

on which trains commenced running regularly last Monday, it will form a route nearly 375 miles long, from Cincinnati northward, giving that city access to Western Michigan and Northwestern Indiana.

Milwaukee & St. Paul.

The company will build a brick passenger house, 50 by 110 feet, and two stories high, in La Crosse. Just above this a large freight house will be built.

Memphis & Little Rock.

There is now but fifteen miles of this road to be completed, and it is asserted positively by the officers that trains will be running through between Little Rock and the Mississippi river by Christmas. A contract has been let for the construction of a bridge over the White river at Duvall's Bluff, being the eastern terminus of part of the road operated.

The Narrow Gauge in Canada.

The London *Railway News* says: "We are glad to learn that Messrs. Laidlaw, Gordon, and Shedden, who recently arrived here from Canada to inquire into the narrow gauge system of railways, have fully satisfied themselves as to the merits of that system. They have, we are informed, made satisfactory arrangements for the supply of iron for the railways with which they are connected, and have also made themselves personally acquainted with the full working of the narrow gauge system in Norway. We have no doubt that the result of their inquiries will be advantageous, and that now that they have returned to Canada they will be in a position to push forward vigorously the system which they have seen is capable of being successfully worked in this and other countries."

Gilman, Clinton & Springfield.

Mr. Leverett Brown, who has the contract for grading the section from Gilman to Clinton, 65 miles, informs us that his division will be completed about the middle o October. The work has been considerably delayed by difficulties in securing the right of way, but matters were finally arranged last week and there will probably be no further interruption.

The division between Clinton and Springfield is in charge of Messes. Tuttle, Matheney & Co.

East India Railroads.

The 4,628 miles of railway which are now open in India, have cost about 79,000,000*l.* The total amount expended up to 31st March last amounted to 83,444,147*l.*, but this includes the cost not only of the open portion, but also of many miles still in course of construction. The gross receipts last year were 5,709,382*l.* as compared with 5,320,723*l.* in the previous year, and the net receipts were 2,520,952*l.*, and 2,522,622*l.* in the two years respectively. The railways were thus earning last year at the rate of about 3*l.* 4. 6d. per cent. per annum on the capital expended on them, 1,380,000*l.* short of the guaranteed interest payable on such expenditure, and 1,412,919*l.* less than the amount paid for guaranteed interest on the whole capital raised, including that employed on unopened lines and the unexpended portion as well. The number of passengers carried during the year was 16,011,633, compared with 15,066,530 in the previous year. The amount of goods traffic was 2,588,513 tons. The train mileage was 12,318,086 last year, and 11,980319 the year before.—*Engineering.*

Minnesota & Northwestern.

This railroad, which is really an extension of the Southern Minnesota from the present western terminus at Wells northwestward to Mankato, is being graded rapidly, forces being at work all along the line between Wells and Good Thunder Ford.

Telegraphs in China.

The Shanghai correspondent of the London *Times* writes: "Speaking of telegraphs, we are likely soon to be connected with Europe, despite the puerile exclusiveness of the Government. A Russo-Danish company is bringing down a cable from the Amoor, and the China Submarine Telegraph Company promises to lay a cable to Singapore, Hong Kong, and up the coast to Shanghai in the course of a short time. To neither, I believe, would the Pekin officials allow the right of landing even the shore end of the cable. All they would consent to was the laying of one which should be *bona fide* submerged. They probably thought this would quash the project; but the expedient of bulks can be resorted to. Yet one would think, they must see that no convulsion of nature has followed the erection of telegraph wires in the foreign settlement of Shanghai, where we do not wait to ask permission. Two of the large steam companies have telegraphic communication along two miles of river front between their head offices and their wharves, and the municipal council have connected the several police stations in a similar way. The wire runs through a Chinese population of some 100,000, yet I have not heard that these people, who are represented by their rulers to be so deadly opposed to telegraphs, have ever remonstrated or dreamed of regarding the wire otherwise than with curiosity."

Chicago & Iowa.

Grading was commenced on this line last week in the town of Squaw Grove, DeKalb county, twenty miles west of Aurora. It is intended to have it completed from Aurora to Rochelle, 42 miles, by the 1st of January.

Fort Wayne, Jackson & Saginaw.

The 25th inst. is named as the time when trains will commence running regularly between Fort Wayne and Jackson over the Fort Wayne, Jackson & Saginaw Railroad. This gives Detroit access to Northeastern Indiana, from which hitherto it has been quite shut out.

Southern Minnesota.

This company has no elevators or warehouses on its line, but grain is received at private warehouses at the various stations and there graded, and the competition is said to secure fairness in grading as well as moderate rates for handling and storage.

New Railroad on Long Island.

A new railroad company has been formed on Long Island, to construct a road along the entire north shore, from Jamaica through Manhasset, Roslyn, Glen Cove, Oyster Bay, Cold Spring, North Port, Smith town, Port Jefferson, Setauket, and so on along the shore of the Sound to Orient. The capital of the company is $5,000,000—$1,000,000 of which has already been subscribed. The design of the incorporators is to connect at Jamaica with the Southside Railroad from that point to Brooklyn, and to lay steel rails, a double track, and have none but first-class rolling stock. The proper certificates of incorporation have been filled with the Secretary of State. The incorporators, it is understood, ask of the inhabitants a subscription of three-fourths of a million out of the five millions, and will ask no money from any village until the completion of the road to such a village.

Indianapolis, Peru & Silver Lake.

The articles of association of this new Indiana company were filed on the 8th inst. The proposed route is from Peru, Miami county, to Silver Lake, Kosciusko county, passing through Miami, Wabash and Kosciusko counties, Indiana, a distance of twenty-six miles, in a northeasterly direction. The amount of capital stock is fixed at five hundred thousand dollars, consisting of ten thousand shares of fifty dollars each. The directors are H. J. Connor, D. E. Terry and Adam Stout, of Silver Lake; George L. Dart, and Jas. M. Brown, of Peru; C. E. Cole, of Grand Rapids, Michigan; Daniel Shumaker, of Rome; Abram Yost, of Stockdale, and Dr. Augustus Case, of Twin Lake.

Huntington & Chicago Extension.

This company has been formed for building the Indiana division of the Baltimore, Pittsburgh & Continental Railway. The proposed route is through Bluffton, Huntington, Rochester and Valparaiso, to Chicago.

St. Joseph & Denver.

On the 6th inst. the County Court of Buchanan county, in which St. Joseph, Mo., is situated, ordered a loan to this railroad company of $160,742.22. This amount was the proceeds of the sale of the county's stock in the Hannibal & St. Joseph Railroad Company. The loan is made on a note of the St. Joseph & Denver company bearing interest at the rate of 10 per cent. per annum and payable sixty days from date, and duly endorsed by D. M. Steele, A. M. Saxton, A. Beattie and R. E. Turner. The company also deposits, as collateral security, a certificate of 10,000 shares of full paid up stock.

Memphis Railroads.

A correspondent of the Chicago *Tribune* writes as follows of the railroads, existing and expected, of Memphis:

"It cannot be denied that, viewed as a railroad centre, the prospects of Memphis are flattering. The Louisville & Memphis, Memphis & Charleston, and Mississippi & Tennessee roads have long been permanent realities. In addition to these roads, the Mississippi River road, from Cairo to Memphis, may now be said to be an accomplished fact. The city and county have also lately voted a half million of gold-bearing bonds in aid of General Forrest's pet road, the Memphis & Selma, which is now rapidly being built. This makes five roads immediately terminating in the city. On the Arkansas side the Memphis & St. Louis road is working quite a large force; while the Memphis & Little Rock, as ever in the past, drags its weary way along. Memphis is thus seen as the certain terminus of no less than seven different lines, to say nothing of several projects that, as yet, have taken no tangible shape."

Branches of the Central Pacific.

The San Francisco *Call* says: "The people of Austin, Nevada, are seriously discussing the project of constructing a branch line of railway from that place to some point on the Central Pacific, probably Battle Mountain. The distance is but ninety miles, and the Central Pacific Company is said to be ready to construct and operate the road, if the people will subscribe stock sufficient to grade the way. The *Reveille* thinks this will not cost more than a hundred thousand dollars—doubtless a very incorrect estimate, as six thousand dollars per mile is a low average cost for grading a railroad over ordinary ground, and this exclusive of bridging or ballasting. If a road bed could be prepared, ready for the track, from Austin to Battle Mountain, for five hundred thousand dollars, we should call it cheap work, and the probabilities are that it would cost much more, unless, indeed, the Reese River valley, which it would follow most of the way, is an unusually favorable route. This line, the *Reveille* says, would pass in close proximity to several rich mining districts, and would rapidly develop the wealth of that portion of the State. Undoubtedly the road should be built, and a county and municipal subscription on the part of Austin and Lander county would probably be a profitable investment. The Central Pacific needs branch lines to tap the country at various points, and act as feeders to the main stem, and the people of these interior districts will find their subscriptions return to them with interest, in the rapid increase of population and value of their property, resulting from the advent of the railroad."

Chicago & Michigan Lake Shore.

A meeting of the stockholders of this company and also of the Grand Rapids & Lake Shore Company was held in Grand Rapids on the 7th inst. to further perfect the consolidation of the two companies. The directors elected were: James F. Joy, A. H. Morrison, D. L. Filer, Chauncey Davis, M. L. Sweet, S. R. Sandford, John Bean, jr., Thomas Heffron and Warren Campbell. Mr. Joy was then elected President; Mr. Morrison, Vice-President; and Mr. Isaac Livermore, of Boston, Treasurer.

Flint & Pere Marquette.

The Saginaw *Enterprise* says:

"The track laying on the Fourth Division of 20 miles was completed on Saturday, September 3d. The ballasting of the west half will be finished in about a month or six weeks, when the division will be officially examined by the Governor for purposes of acceptance under the Land Grant Act.

"The division ends in the Northwest corner of town 16, range 3, west. A force of 250 men are grading the next 20 miles, and the company expect to lay track on at least 10 miles of it this fall. An extension of three miles from the present ending of the track brings the road to a point due north from Isabella City. The Railroad Company have agreed to turnpike five miles of a road from this line to Isabella, and the inhabitants are to improve the balance of the distance, so that a good road may be expected by December 1st, and the track will be laid to the point of intersection.

"Contracts will be let soon for the grading of the Sixth Division extending to the crossing of the Grand Rapids & Indiana Railroad."

Western & Atlantic.

A bill is now pending in the Georgia Legislature for leasing this road, which provides for advertising by the

Governor for bids for the lease of the road for twenty years, giving bond and security for the return, at the expiration of the time, in as good order as at present. The road shall not be leased for less than $35,000 per month, gold.

Belleville & Southeastern.

Ten miles of track have been laid from New Athens eastward, and the road is completed from Du Quoin west to Williams Creek, beyond which it cannot proceed for a few days, as the bridge is not yet completed.

Portage City to Lake Superior.

The survey of the northern division of this proposed Wisconsin road is nearly completed. Two routes have been surveyed on the Portage Division, between Portage and Ripon, one by the way of Markesan, and the other by way of Dartford, Princeton and Montello.

Burlington & Southwestern.

The Bloomfield (Iowa) *Republican* says that a committee from that town "met President Tracy at Ottumwa "and entered into writing that virtually locates the road "to Bloomfield, by way of Pulaski. It is agreed on our "part to grade, bridge and tie the road between these "two points. Our obligations to the company are not "binding except the proposed township tax is author- "ized at the election on the 3d of September, and in case "the tax carries, the company is bound to complete the "road and have the cars running to Bloomfield by the "2d day of Jannary, 1872."

The city of Cameron has voted to increase its subscription to the company from $25,000 to $50,000.

Missouri, Kansas & Texas.

About 75 miles of the division of this road between Sedalia and Fort Scott is now completed, reaching from Sedalia to near the southern line of Bates county, about 30 miles from Fort Scott. It is expected to reach Fort Scott by the first of October.

South Georgia & Florida.

The building of the bridge at Albany, over the Flint River, is rapidly advancing under the supervision of Capt. Barnwell, one of the contractors. This bridge will be probably completed about the middle of October, when through trains from Savannah will arrive *via* Thomasville and the Savannah & Gulf Railroad.

New Orleans, Jackson & Great Northern.

A correspondent of the Chicago *Tribune* writes as follows of this road in the hands of the Southern Railroad Association: "The financial success of McCombs & Co. in obtaining possession of the New Orleans, Jackson & Great Northern Railroad, resulting as it does, in the practical, if not in the ultimate, consolidation of the same with the Mississippi Central, from Jackson to Humboldt, Tenn., promises much of good to the people of Mississippi, as also to New Orleans. Hitherto the two roads, instead of acting in concert, have seemed to vie in mutually opposing the interests of each other; at least, such seems to have been the case with the road from Canton to New Orleans. If prompt connections were made by the Central at Canton, well and good. If not, passengers and mails were left to lie over in a small village, without the slightest regard to their rights in the premises; and this, too, with no connections to make between Canton and New Orleans. Under the new *regime*, however, all this is changed. Instead of there being any change at Canton, as formerly, trains are now run from New Orleans to Jackson, Tenn., and through sleeping-coaches *via* the latter point to Louisville, as also *via* Grand Junction, on the Memphis & Charleston to Chattanooga.

"Already, too, has the work of rebuilding the road commenced in good earnest, all along the line. Trains after trains are seen passing Jackson, bound north, laden with ties and lumber, for renewal of the bridges and road-bed, while gravel trains are seen at work upon almost every section of the road. There is already, too, a marked improvement in the character of the rolling stock, and in the general management of the road. Trains that, in their general equipment, would do no discredit to a first-class Northern line, are now running with regularity and dispatch from Jackson, Tennessee, to New Orleans. The road having now passed into the hands of Northern capitalists, who are practical railroad men, is to be completely and thoroughly rebuilt, and furnished with all the modern appliances of a first-class road. When finished, as it ultimately will be, to Paducah, on the Ohio, there to connect by a bridge with a through line *via* Vincennes to Indianapolis, this will truly be one of the leading thoroughfares of the country.

Cincinnati & Springfield.

The combination of railroad companies to build this line is said to have been abandoned chiefly through the failure of the Cincinnati, Sandusky & Cleveland Company; but it is now announced that a new company has been formed, with R. M. Shoemaker, J. N. Kenny, Seth Evans, Charles P. Taft, and Harvey C. Shoemaker as corporators, which will go to work in earnest. Its line, however, is likely to run east of Dayton and through Lebanon.

Northern Pacific.

It is reported that the route adopted will bring the line north of Rush Lake instead of south of it and ten or fifteen miles north of Otter Tail City.

Buffalo & Washington.

Rails have arrived for the extension of this road from Aurora to South Wales, five miles, and will be put down immediately. Grading is progressing on the five miles between South Wales and Holland, and the road is to be finished to the latter place by the 1st of December. Another section 3½ miles long, from Holland to Protection, is to be completed by the 1st of February. Kenneth McKenzie, of Ashtabula, O., has the contract for the bridges and cattle guards, and A. R. Trew is Superintendent of Construction of that part of the line between Aurora and Olean. The company, it is reported, has secured a long lease of the Buffalo Creek Railroad, which will give it a favorable entrance into Buffalo.

The Iron Mountain Railroad.

The most important event so far as the commerce of St. Lous is concerned, of the past week, has been the completion of the Iron Mountain Railroad connections at Columbus, Ky. We have neither the inclination nor the space to review the difficulties which have constantly intervened to disappoint the hopes and thwart the endeavors of Mr. Thomas Allen to give to St. Louis a direct through railroad to the Atlantic sea-coast and the Gulf, which, crossing the Mississippi below the line of winter obstructions, and traversing the country from west to east in the Southern States, should afford the opportunity of handling importations, especially from tropical countries, with the least danger from climatic changes. Ably seconded in his endeavors by Mr. Superintendent Morley, who brought to the task of extending the road consummate engineering ability, Mr. Allen met each discouragement with a new plan and greater energy, until at last approaches were constructed on either side of the river, and the connection was fully established.

From this connection, as we have intimated, two sources of trade and wealth are placed directly in the control of our merchants. Between the Northwest and Southeast there must always be an exchange of staples, and the line of least resistance is that over which such exchange must be made. The cost of $9 per car for handling freight at Cairo and Columbus was a serious obstacle to the trade. By the connection now made that obstruction is removed, and cars laden with corn, oats, provisions, flour, and wheat, will pass forward to the innumerable villages and cities of the South without breaking bulk. From the connections at Columbus two through roads leave—one for Mobile and New Orleans and one to Nashville. Crossing and intersecting with these are roads that penetrate Tennessee, South Carolina, Georgia, Alabama, Mississippi and Louisiana, and even reach into Florida. To all this territory the Iron Mountain road, through its connections at Belmont, offers speedy and direct transmission of produce and general merchandise. Beyond this the Iron Mountain route brings the Atlantic and St. Louis into more close connection. Mobile is nearer than Baltimore. Charleston and Savannah are not so far off by rail as Boston, New York or Philadelphia. Those cities have opportunities and capacity for importing coffees, etc., not yet developed, but which, aided by St. Louis, may decidedly change the current of trade; and it will be greatly to the advantage of St. Louis to aid in the developing of all these ports, and thus afford a return trade which will enable the Iron Mountain road to carry the freights in each direction at the lowest possible expense.—*St. Louis Republican.*

Detroit & Howell.

The annual meeting was held last week. The directors report that their road had been thoroughly crippled by the decision of the Supreme Court against the validity of municipal bonds voted to it. As to the resumption of work, they say: "We are unable to see any immediate prospects of being able to reach such a point, unless it be thought the raising of means by private subscription, to take the place of municipal bonds, or by negotiation with outside parties, and offering them such terms as will be inducement for them to take an interest in the work, and contribute the funds requisite to an early completion of it. Efforts have been made in that direction, and we indulge the hope that the results will justify our expectations.

Hannibal Maberly.

Work on this line, which will naturally form a connection with the Toledo, Wabash & Western, is progressing rapidly, and the contractors promise to have the road-bed ready by the first of December.

MECHANICS AND ENGINEERING.

The Philadelphia Bridge.

Of this project the Philadelphia correspondent of the *Iron Age* writes as follows: "The bridge enterprise projected, to connect this city and Camden, New Jersey, although moving slowly, is not dead. We learn great labor and difficulty have been experienced in making the preliminary surveys to meet the requirements of the Secretary of War, the soundings alone having already cost $30,000. The work will be commenced on the Camden side during the fall; and the piers are to be constructed of iron tubes 30 inches diameter, instead of stone. The point of approach in this city is not as yet determined. We learn, however, that the work is to be pushed as rapidly as possible, and that capital in abundance is on hand. The government having declared the bridge a post road, there can be no State interference to delay the work. The project is under the charge of Mr. Thomas Speakman, of this city, said to be an able engineer."

Railroad Manufactures.

The Camden Rolling Mills, which have been closed for the last two or three years, have finally been sold by the assignees. The foundry sold for $41,000, and the mills for $82,000.

The Indianapolis Car Wheel Works, of Mercer, Nash & Co., are completed, and are to go into operation at once, and then to melt fifteen tons per day, and employ about thirty men.

The car works of Messrs. William L. Sand & Co., at Pottstown, burned on the morning of the 11th. Loss, $20,000.

A Valuable Wood.

There is a branch of the Trinity River in Texas called the Bois d' Arc, the bottom lands of which for about a mile on each side and for fifty miles in length are covered with a forest of peculiar trees known as "bois d' arc," (bow-wood). From the description of the wood of this tree given in a newspaper of that country, the Kaufman *Star*, it seems probable that it would be an excellent substitute for teak in the Mansell car wheel, and probably valuable elswhere in car building. This description is as follows: "We will venture the assertion that no living man ever saw the symptom of decay in this remarkable timber. The running gear of a wagon that has been in constant use over twenty years, is before us as we write this article, and yet the wood works are, to all appearance as sound as when turned out of the shop. There is an oil in the wood which fills up the pores and prevents either air or water from affecting it. No one can tell how long it will last even when exposed to the weather. A reward might be offered in vain for a decayed particle of this timber. It is not affected by the rays of the sun, and hence it never shrinks. A carriage wheel made of bois d'arc will run until the tire is worn out without having to set it. But the greatest evidence of the superior quality of this wood for wagons and carriages, may be estimated from the fact that a rough home made bois d'arc wagon is worth about double the best Northern-made wagon."

Destroying Railroad Bridges.

One of the war correspondents of the London *Times* writes: "Before abandoning Faulquemont, the point from which the new line is carried to Metz, an attempt was made by the French railway officials to destroy the bridges by a novel experiment. The rails were removed and the track broken up. A locomotive, coupled before and after to two heavily loaded wagons, was started towards the site at a distance of 3,000 paces, and full steam put on before the driver jumped off. The first wagon on reaching the vacuum rolled over, the engine was hurled upon it, and falling over with the other wagon rolled down into the ditch below. The upper masonry of the bridge was shattered, but the destruction of the bridge was not accomplished."

Dead Weight in Cars.

The chairman of an English railroad company, in a speech to the stockholders, said recently: "Down at Ashford they had quite a curiosity shop in a number of old wagons and carriages. They had 116 wagons weighing 5 tons each, capable of carrying a load of only about 3½ tons. Those were being gradually replaced by wagons that would weigh about 4 tons, and carry 8 or 10 tons, thus getting rid of so much dead weight."

Snow Excavator.

A Mr. Hopkins has invented a novel machine for clearing tracks of snow which seems specially adapted to deep snows. It is, indeed, a snow excavator rather than a snow plow. There is over and behind the plow a framework which receives the snow as it is raised above the track by the plow, and contains it until the engine is reversed and the excavator drawn back from the cutting or snow-bank to some open place where there is room to discharge the snow. Ordinarily the snow is pressed or piled on each side, just where there

is the most danger of drift, and where it is likely to fall back again, and the work of clearing the track must be done over and over again. But by Mr. Hopkins' machine a cutting a little wider than a car is made through the drift, and the snow is removed entirely. There is no danger of sticking fast in the drift, but the excavation is made complete as fast as the engine progresses.

Working Heavy Grades.

Mr. H. D. Whitcomp, Chief Engineer and Superintendent of the Chesapeake & Ohio Railroad, in a letter written about two years ago gives the following account of some of the heavy work on his line, at the crossing of the Blue Ridge:

"The track was 5½ miles long, maximum (grade) on tangent 278 per mile, on curves 250 feet per mile; minimum radius (of curves) 232 feet. Some of these curves were on trestles 40 feet high. We used this track from 1854 to 1857 without an accident except in a trial trip, and that not serious and not the fault of the road but of the brakes on the car.

"Since that track was made we have made another at a point further west to avoid some very heavy work which we did not have money enough to complete. We have been working that for eleven years without an accident. The maximum grade is 308 feet, on curves of 500 feet radius. The minimum radius is 400 feet and on 252 feet grade. Our ordinary engines traverse this tract with the assistance of the engines formerly used over the Blue Ridge track.

"We are now constructing a third track still west of this point and on the grade ascending the Alleghany. We have on this grade a tunnel 3,600 feet long, and at the eastern end of it an embankment 185 feet deep. To avoid this temporarily we are now constructing a grade of about 280 feet per mile on curves of 600 feet radius.

* * *

"The usual load drawn over the 308 feet grade by these Baldwin Engines is three loaded freight cars, a gross weight of say 50 tons, but they will draw four cars. The speed we adopt is from five to six miles per hour. We have in our Mountains in the winter both snow and sleet, the latter as bad as you ever have it."

The St. Louis Bridge.

The work is industriously progressing on the east pier, and the masonry is now twelve feet above water. At the west pier the derrick barges have been removed, and the frames for the new derrick, which is to assist in carrying the pier up to the full height, are being placed in position. No stone has been laid on this pier since the last account published in the *Republican*. Next Monday work will resume on the west abutment, or as soon as the granite can be obtained from the vicinity of Iron Mountain. One of the small approach piers has been built up to the levee line, and the laying of granite will commence in a few days. Several loads of this stone have arrived during the week, and no more delay is expected on this account. Approach pier No. 2 will be excavated in a few days. All these approaches rest on the solid rock, the same as the main or river pier. The caisson is in a forward state, the last course of timber is being placed on it, and it will be launched in two weeks. The Grafton stone for the western abutment has been received. It is confidently predicted that all the masonry can be completed by May, 1871. A large force of men are at work cutting out sandstone, at Ste. Genevieve, to be used in the bridge work.—*St. Louis Republican.*

Remarkable Engineering Operation.

The recent change of grade in Fifth avenue, between Sixty-eighth and Seventy-second streets, laid bare the two large three foot iron water-pipes which supply the city below Central Park, and rendered it necessary for them to be lowered to the depth of about four feet, in order to protect them from frost and from injury by the constant passing of vehicles. As one pipe is not of sufficient capacity to supply the wants of the city below Central Park, it was decided to prepare a bed on the west side of the avenue as a temporary resting place for the pipes, while a proper trench, twelve feet wide and from one to four feet deep, could be excavated for them beneath the line they had occupied. This was no easy task, as the pipes were then laid in a trench cut through solid rock, and, before they could be moved an inch, one side of the trench had to be blasted and removed with the utmost caution. When the temporary bed, some eight to ten feet wide, was properly prepared, the Croton mains, each about 1,000 feet in length, were slipped sidewise on wooden blocks with great care, so as not to disturb any of the joints. The magnitude of this task may be inferred from the fact that every foot of pipe, including the water contained therein, weighs about 1,500 pounds. After the pipes were shifted to the temporary bed, a trench 12 feet wide and from one to four feet deep, was excavated through the solid rock along the center of the avenue. Into this the pipes are now lowering without interrupting the flow of water through them. The pipes were laid in 1840, and appeared to be very little corroded, and the hemlock blocks from the northern part of the State, upon which the pipes have rested for the last thirty years, are as sound to-day as they were when buried with the pipes.—*New York Tribune.*

ELECTIONS AND APPOINTMENTS.

—The following were recently elected directors and officers of the West New Hampshire Railroad: J. Gregory Smith, of St. Albans; D. L. Harris, of Springfield, Mass.; Wm. B. Washburne, of Greenfield, Mass.; J. D. Hatch, of Burlington; W. H. Haile, of Hinsdale, N. H.; F. A. Nash and S. M. Waite, of Brattleboro. S. M. Waite was chosen President; Thomas E. Hatch, of Keene N. H., Secretary; Seth Hunt, of Northampton, Mass., Treasurer.

—The President has appointed Gen. G. M. Dodge, of Council Bluffs, Iowa, and Robert J. McEthaney and A. L. Rountree, of Springfield, Mo., commissioners to examine and report on the first 50 miles of the road and telegraph line of the Atlantic & Pacific Railroad Company.

—J. C. Morse has been appointed agent of the South Shore Fast Freight Line at Toledo. He has been long in the service of the Michigan Southern line.

—The annual meeting of the Indianapolis, Bloomington & Western Railway Company was held in Urbana, Illinois on the 14th inst. The following directors were elected: D. Ricketts, Jeffersonville, Ind.; S. C. Wilson, Crawfordsville, Ind.; George Nebeker, Covington, Ind.; J. C. Short, Danville, Ill.; W. H. Smith and Clark R. Griggs, Urbana, Ill.; W. Y. McCord, Farmers' City, Ill.; H. Conkling, Bloomington, Ill; D. T. Thompson, Pekin, Ill.; B. E. Smith and Wm. Dennison, Columbus, O.; A. Turner and W. W. Phelps, New York. All these except the three last named were members of the old directory. D. T. Thompson takes the place of Ties Smith, and Messrs. Turner and Phelps of J. M. McKee of Crawfordsville and J. O. Cunningham of Urbana. At the directors' meeting Clark R. Griggs, President, J. S. Oliver, General Superintendent, and W. F. Slater, Assistant Superintendent, were all re-elected.

—D. B. Morey under the management of the Southern Railroad Association has been made General Ticket Agent of the New Orleans, Jackson & Great Northern Railroad with headquarters at Water Valley, Miss.

—The following persons were recently elected directors of the Blackwater River (N. H.) Railroad Company: C. C. Coffin, Boston; A. M. Shaw, Lebanon; J. Y. Mugridge, Concord; Joseph Barnard, Hopkinton; Cyrus Cookin, Salisbury; J. C. Pearson and B. F. Sawyer, Webster. This board organized by the choice of C. C. Coffin, President, Joseph Couch, Clerk, and J. C. Pearson, Building Agent.

TRAFFIC AND EARNINGS.

—For the week ending August 20 the earnings of the Grand Trunk Railway were:

1870	£28,200
1869	28,000
Increase (5-7 of one per cent.)	£ 200

—The earnings of the Great Western Railway for the week ending August 19 were:

1870	£13,945
1869	£13,138
Increase (6 per cent.)	£ 807

—The receipts of the Grand Trunk Railway of Canada for the week ending August 13, were:

1870	£29,100
1869	26,815
Increase (8¾ per cent.)	£2,285

—The earnings of the Great Western Railway of Canada for the week ending August 12, were:

1870	£14,370
1869	12,025
Increase (19½ per cent.)	£2,345

—The New York *Tribune* is informed that the cabin passenger travel on the Pacific Mail Company's line from San Francisco to China and Japan has more than doubled since the opening of the railroad to the Pacific, and that the number of cabin passengers from San Francisco is increasing, and the business of the company is prosperous.

OLD AND NEW ROADS.

[*Continued from Page 585.*]

Baraboo Air Line.

By vote of 347 to 3 Baraboo voted last Saturday to subscribe $70,000 to this road, which is to form the Madison & Winona Line of the Chicago & Northwestern.

Des Moines, Boone & Northern.

This is the name of a company lately organized to build a railroad from Des Moines to Mankota, Minn.

Fredericksburg & Charlotteville.

Fifteen miles of track on this line from Fredericksburg westward has been laid.

Iron Mountain.

The first section of twenty miles from Pilot Knob has been laid out, and a large force of men are engaged in grading through the hills at Arcadia, two miles southwest of Pilot Knob. Extensive preliminary surveys have been made as far south as the Arkansas line, near which point it will intersect the Cairo & Fulton line.

Chicago, Southwestern & Nebraska.

This is the name of a company lately organized to construct a branch of the Chicago & Southwestern Railway from a point about eighteen miles west of Centre ville nearly due west to Nebraska City. This would occupy almost identically the same ground as the Burlington & Southwestern, being close to the Missouri line in the southern tier of counties of Iowa.

Toronto, Grey & Bruce.

There is a difficulty among the directors of this Canadian company. One party has negotiated a loan of $250,000 on the security of $400,000 of the company's bonds, the bonds to become the property of the lenders if the loan is not paid in two years with 12 per cent. interest. The other party claims that an offer of a loan by the firm of Gooderham & Worts, of Toronto, should be accepted.

PERSONAL.

—Thomas H. Callaway, President of the East Tennessee, Virginia & Georgia Railroad, and one of the most prominent railroad men of the South, died on the 29th ult.

—Col. C. N. Pratt, General Agent of the National Land Company, while on the Kansas Pacific excursion to Denver, was presented by the Chicago press as represented, with a handsome moss agate ring, as a token of esteem and gratitude for his efforts in promoting their comfort on this trip. The occasion was marked with much good feeling and hilarity.

MISCELLANEOUS.

—At a meeting of the stockholders of the Wells, Fargo & Co. Express Company on Sept. 1, it was voted to reduce the capital stock from $15,000,000 to $5,000,000, reduction to be made by exchanging three shares of the old for one of the new stock. The exchange of share certificates will be made as soon as the new certificates can be prepared, probably about the 10th of October next.

—The Western Railroad of France is proceeding actively with the works of the second portion of its line from Paris to Dieppe *via* Pontoise. The distance from Gournay to Dieppe is about 45 miles; and after the completion of the Dieppe direct line the whole distance from Paris to Dieppe will be reduced to 105 miles.

—It is feared that the new regulations now being prepared concerning the transportation of goods to inland cities, in bond, will be fruitful of annoyance to shippers. It appears that the law on the subject, as construed at the Treasury Department, imposes so many new expenses upon the shippers that the old way of paying duty at the seaboard and shipping goods free to the interior, will be found cheaper.

—The British Indian Extension Telegraph Company's Cable is now completed. The greater portion has been shipped on the Edinburgh, which vessel is now on her way to Singapore, *via* Suez Canal. She has somewhere about 1,050 nautical miles of cable on board. She will be joined by the steamship Scanderia and William Corry, with the remainder of the cable, the former having received her complement, and the latter has now about finished shipping, when both will shortly leave. The total length of cable made for this company's line, from Madras to Singapore, is 1,834 nautical miles.

—On the 27th day of February, 1866, Mrs. Elvira C. Coulter, (now Huffman), who had taken passage on the Hannibal & St. Joseph Railroad, at Macon, for Carbon, a station four miles east of Macon, in getting off the train at the last named place, had her underclothes caught on a bolt on the platform of the car, which threw her down, and the train starting at the time dragged her some yards, causing, as she claimed, a serious injury. She sued the company for damages to the amount of $30,000 in the Macon Circuit Court, at the August term 1866. Judgment in her favor to the amount of $12,000 was rendered at the September term, 1869, from which the company appealed to the Fourth District Court, where the judgment was reversed, and remanded to the court below at the January term, 1870, for a re-hearing. Whereupon Mrs. Huffman took the case to the Supreme Court, on a writ of error, when it was set for a hearing at the August term, 1870, but no notice having been given to defendants, the case did not stand for trial. During the term, however, a compromise of the case was effected with Mrs. Huffman by James Carr, Esq., attorney for the road, the defendants paying her the sum of four thousand dollars.

RAILROAD GAZETTE

PUBLISHED EVERY SATURDAY.

CONTENTS.

	Page.		Page.
Evaporation Meter for Boilers	577	SELECTIONS.	
CONTRIBUTIONS.		New Railroad Combin's	589
Deterioration of Boiler Plates	578	Contributory Negligence	590
Steel Crank Pins	578	GENERAL RAILROAD NEWS.	
SELECTIONS.		Old and New Roads	583 & 585
A New Combination	577	Mechanics and Engineering	584
On the Preservation of Timber	578	Elections and Appointments	585
Mileage Ticket	579	Personal	585
Thomson Road Steamer	579	Traffic and Earnings	585
Routes of Cotton Transportation	580	Miscellaneous	585
A Model Belgian Iron Works	580	Register of Earnings	588
The Unit of Length	581	EDITORIALS.	
Centralizing Motive Power	581	Color-Blindness	586
Improvements in Railway Construction	582	The Kansas Pacific Excursion	586
Railroad Traveling in France	582	Indianapolis, Bloomington & Western Railway	587
Brave Act of an Engineer	582	The Texas Cattle Trade	587
The Master Mechanics' Convention	589	The Chicago & Iowa Railroad	588
Conductors' Life Insurance Company	590	Canadian Prosperity	588
		The Pullman Cars in America	583
		CHICAGO RAILROAD NEWS	588

Editorial Announcements.

Correspondence.—We cordially invite the co-operation of the Railroad Public in affording us the material for a thorough and worthy Railroad paper. Railroad news, annual reports, notices of appointments, resignations, etc., and information concerning improvements will be gratefully received. We make it our business to inform the public concerning the progress of new lines, and are always glad to receive news of them.

Articles.—We desire articles relating to railroads, and, if acceptable, will pay liberally for them. Articles concerning railroad management, engineering, rolling stock and machinery, by men practically acquainted with these subjects, are especially desired.

Inventions.—Those who wish to make their inventions known to railroad men can have them fully described in the RAILROAD GAZETTE, *if not previously published,* FREE OF CHARGE. *They are invited to send us drawings or models and specifications. When engravings are necessary the inventor is expected to furnish his own engravings or to pay for them.*

☞ *Our Prospectus and Business Notices will be found on the last page.*

COLOR-BLINDNESS.

The *Atlantic Monthly* for August has an article on color-blindness, which is very interesting to the general reader and should be very suggestive to railroad men. Persons who have not given attention to this disorder have very little idea of its frequency. In our own personal experience we have known one man who described the color of the water on the lake at Chicago, at a time when it was of the most beautiful *sea-green*, as being a sort of *umber* color; another who could not distinguish the color of green shutters from that of the church to which they were attached, and which was painted a sort of buff-color. A personal acquaintance who was employed for a number of years on a steamboat could not tell a red light from a green or blue one and said that all the flowers in bouquet looked alike to him. What is most singular is that persons who have this peculiarity are not usually defective in their power of vision but see objects as clearly as those whose perception of color is perfect. It needs no argument to convince an experienced railroad men that a person who cannot tell a red flag from a green one would not be a safe person to run a locomotive, or have charge of a train. That anyone should have any doubt whether a signal light which is visible is green or red seems to most of us incredible, and yet we must either discredit the strongest evidence or else believe that to some people it is impossible and to many extremely difficult and always (to them) a matter of doubt. That color-blindness may be, and probably is, a prolific cause of accidents on railroads seems to be not unlikely, considering how common the defect is. Persons who are thus affected usually take pains to hide their deficiency, which leads to the suspicion that many cases of otherwise unaccountable neglect may be attributed to this cause. There is an abundance of evidence showing that inability to distinguish colors occurs in every degree, from total color-blindness up to the nicest perception of their harmony. It will often be caused or increased by disease, fatigue, accident, (as injury to the eye), indigestion, or intemperance. The following curious case, attributable to the latter cause, is related in the *Atlantic*.

"On rising in the morning, he was surprised to find that "the carpet of his chamber had lost its color. The fig-"ure was there, but in black and white only. He called "to his wife in alarm to know if the carpet had been "changed. It had not, and with a divination strictly "feminine, she went straight to the root of the matter at "once. He had taken too much wine, or, as he ex-"pressed it, several kinds of wine at dinner the evening "before; and now, his attention being called to the "curious phenomenon as a result of wine drinking, he "found later that whenever he partook of wine at din-"ner his perception of color was imperfect in the morn-"ing, although his power to distinguish forms remained "unimpaired. When he took punch or spirits, color-"blindness was produced in a still greater degree."

This case is curious in itself, and would add an additional argument in favor of temperance if one were needed, or furnish a good reason for not "mixing your liquors."

A writer in *Nature* says of his own eyes, "That my "right eye is distinctly less sensitive to color than my "left. This I have since verified in various ways. * * * "The difference consists in this, that all colors appear "less bright, or as I should say, *greyer*, when seen with "the right eye, and the more delicate gradations of color "cease to be perceived, while in many cases of "even strongly contrasted colors, I should find it diffi-"cult to distinguish them with certainty with the right "eye, especially if I had not previously seen them with "the other eye."

What seems most remarkable is, that a person affected with color-blindness usually seems to have most difficulty in distinguishing the *complementary* colors from each other, or those which to the ordinary eye seem to be in the strongest contrast, as red and green. This peculiarity, in a railroad man, is the one which would be most fruitful of danger. An engineer on an express train must never for the fraction of an instant hesitate to decide whether a light or flag is red or green. That any one should be capable of a doubt on such a matter is almost incomprehensible to most of us, but not only are there persons who would be in doubt, but there are those who are *entirely incapable* of distinguishing the one color from the other. There is probably not so much danger to be apprehended from the most extreme cases of this visual disorder as from those which are more obscure. A man who is always and utterly incapable of distinguishing red from green would probably soon be found out. But such extreme cases are very rare. Probably many whose perception of color is weak are not themselves aware of their own deficiency. When the disorder varies from the effects of disease or other causes, it must be impossible for the person thus affected to tell when they see color correctly. Take the case of the man whose eye for color was ordinarily very good, but who saw vaguely after imbibing too miscellaneously the night before. He evidently would not be a safe man to run the "Pacific express" or the "Chicago special."

Numbers of instances are recorded where the perception of color has been temporarily impaired by excessive fatigue, and it seems not at all improbable that there may be times when the subtle power of distinguishing colors may vanish from an overtaxed engineer, an exhausted fireman, or a brakeman whose whole strength is required to resist the encroachments of much needed slumber.

We call attention to this subject because we believe it has not received the attention which its importance deserves. That some sort of examination of the qualifications of railroad employes would increase the efficiency of their service we think there can be little doubt. On this subject we will have something more to say at some future time. The only thing required now by most companies is, that the candidates for employment should be able to read and write. It certainly does not seem unreasonable to require of him that he should see correctly.

It would be a comparatively easy matter for any railroad superintendent or master mechanic to test the capability of each of his engineers, firemen, conductors, brakemen or signal-men for distinguishing the colors of flags in daytime and lights at night, and at different distances. A careful record of such experiments would not only be useful to railroad men, but would be a valuable contribution to science. Flags not only of different colors but of different shades of the same color should be used, and so of lights. Proper discrimination should be made between those men who cannot *distinguish* one color from another and those who are only deficient in *naming* them. A man might, for example, perceive the difference between a crimson and a scarlet flag, and know the *quality* of each color, and yet not know the name for either of them, which is a very different thing from not perceiving that they are unlike or confusing them with green.

As most people who are either totally or partially color-blind endeavor to conceal the defect, if any experiments should be made with the employees great care should be taken that those whose sight it is most desirable to test do not avoid the trial.

We should be glad to hear the results of such experiments, if any of our railroad managers should make them, or of any individual cases of color-blindness which may come under the notice of any person employed on railroads.

THE KANSAS PACIFIC EXCURSION.

The magnificent opening excursion over the Kansas Pacific Railway, attended by over a hundred invited guests, representing the press and many of the leading railroads of the country, was one of the eminent events of the year, and fairly eclipsed every other effort of the kind on record. On the part of the Railway Company, it was a twelve days' sumptuous entertainment, and on that of the towns on the route, it was an ovation from first to last. Every thing that could add to the comfort or satisfaction of the guests, as well as minister to the eye or palate, was munificently afforded. Even in the center of the Great American Desert—which, by-the-bye, is a myth—every luxury that money could purchase in almost any part of the world, was here freely poured out. It is a common thing to hear it said that all the so-called luxuries of modern travel are only devices to take off the edge of its miseries, but for once it was true that positive sumptuousness was enjoyed on this trans-continental tour by every member of the party.

Among the excursionists were the following well-known officials and journalists:

Hon. J. A. J. Cresswell	Postmaster General.
Hon. Giles A. Smith	Second Assistant Postmaster General.
John D. Perry	President Kansas Pacific Railway Co.
Adolphus Meier	Vice President Kansas Pacific Railway Co.
Hon. J. P. Usher	Solicitor Kansas Pacific Railway Co.
T. B. Blackstone	President Chicago & Alton R. R. Co.
Gen. Anson Stager	Gen'l Supt. Western Union Tel. Co.
Gen. James Craig	President Hannibal & St. Joseph R. R. Co.
George H. Nettleton	Gen'l Supt. Hannibal & St. Joseph R. R. Co.
Wm. Prescott Smith	Gen'l Manager New York & Washington Through Line, Baltimore, Md.
J. L. Griswold	Gen'l Supt. Ohio & Mississippi R. R.
S. H. Knight	Gen'l Supt. North Missouri R. R.
Col. B C. Clowry	Supt. Western Union Tel. Co., St. Louis.
M. Baird	Baldwin Locomotive Works, Philadelphia, Pa.
H. Gray	Car Department C. & N. W. R'y. Chicago.
A. B. Pullman	Gen'l Supt. Pullman Palace Sleeping Car Co.
Hon. Erastus Wells, M. C.	St. Louis, Mo.
Dr. William Bell	London, Eng.
Dr. Robert H. Lamborn	Secretary and Treasurer Lake Superior & Mississippi R. R. Co., Philadelphia, Pa.
George H. Morgan	Secretary Merchants' Exchange, St. Louis, Mo.
I. W. England	Publisher New York Sun.
Dr. F. Morwitz	German Democrat, Philadelphia.
A. W. Francisco	Cincinnati Times.
S. H. Gay	Managing Editor Chicago Tribune.
J. B. Stillson	New York World.
Hon. John Forsythe	Mobile Register.
D. A. Goddard	Boston Daily Advertiser.
F. E. Goodrich	Boston Post.
A. Miner Griswold	(Fat Contributor) Cincinnati Times.
J. T. Ely	Secretary to President Grant, Washington, D. C.
D. L. Walbridge	Missouri Democrat.
J. W. Butler	St. Louis Dispatch.
J. B. Mitchell	of J. B. Lippincott & Co., Philadelphia.
Col. John S. Loomis	President National Land Company New York.
Gen. Geo. A. Custar	U. S. A.
E. E. Barney	of Barney, Smith & Co., Dayton, Ohio.
C. N. Pratt	General Agent National Land Company, Chicago, Ill.
Hon. M. McGee	Mayor of Kansas City, Missouri.
Hon. G. Grosvenor	Mayor of Lawrence, Kansas.
Gen. Wm. J. Palmer	Director of Construction, Kansas Pacific R'y.
Col. W. H. Greenwood	Chief Eng. of Construction, Kan. Pacific R'y.
A. Anderson	General Superintendent Kansas Pacific Railway.
Col. Chas. B. Lamborn	Secretary Kansas Pacific Railway.
Josiah C. Reiff	General Eastern Agent Kansas Pacific Railway.
R. S. Elliott	Industrial Agent Kansas Pacific Railway.

So fully has the journal of this trip been published in the daily press that no repetition of details is necessary, though we may with propriety place upon record the salient features of the excursion.

The train, which consisted of eleven of Pullman's cars, to-wit: five day and sleeping cars, one parlor and sleeping car, three commissary cars, one smoking car, and one baggage and provision car, left St. Louis on Tuesday evening, August 30th, by the North Missouri Railroad. The general charge of the excursion was entrusted to Col. Chas. B. Lamborn, the Secretary of the company, to whom much of the delight of the trip was due; while the details of the "creature comforts" were in charge of Col. A. B. Pullman, Superintendent of the Pullman Palace Car Company, who, though present as a guest, gave much of his attention to the personal comfort of the excursionists. These eleven coaches constituted the most gorgeous and luxurious traveling hotel ever yet devised, and were the admiration and astonishment of every one who saw them.

At Kansas City, Leavenworth and Lawrence, the party were received with open arms, feasted, and escorted over the places by the public-spirited citizens, and the advantages and beauties of those enterprising cities obligingly shown. At Ellsworth the plains were struck, from which point to Denver, about 416 miles, the road runs through the old geographical American Desert,—a region that lacks water only, to make it blossom as the rose.

On the third day out, while crossing the plains, after the party had had an opportunity to see the utter helplessness of life in that region without a railroad, Judge Usher made an interesting speech stating the objects of the company, its past difficulties, its present resources, and its future hopes and intentions. In the southwestward extension of the road he claimed that, if no subsidy were allowed, Congress should at least grant the alternate lands on forty miles on each side of the road, instead of twenty, or in other words, of as much as was granted to the Northern Pacific Company. He also asked with ex-

cellent reason, that the grants be made, not in alternate sections, but in alternate townships, so that colonies might settle without being swindled by the land sharks which seize on the government lands lying in and among the sections sold to the colonists by the company; and also because the extensive range required for grazing called for larger farms than a single section. By a large map the speaker illustrated the four proposed routes to the Pacific, one of which must be adopted at no distant day. The subject of irrigation, without which nothing but buffalo grass will grow on the plains, seemed both to the speaker and to the audience so important and so necessary to the settlement of the region that an additional grant from Congress might profitably be made to induce the experiment. It was believed that the waters of the Arkansas and other rivers could be made to perform a wonderful work in making a naturally fruitful soil but one seldom favored by a drop of rain, produce the richest vegetation, as had already been proven in Colorado.

Col. Loomis followed, and explained the relation which was sustained by the National Land Co., of which he is President, to the Kansas Pacific and Denver Pacific roads, who have placed their lands in his hands for sale. Instead of having the paraphernalia and expense of a Land Department, these companies have agreed to pay a commission to the National Land Company to sell their lands, and the most gratifying results have followed. In the few months prior to the organization of this company, only 20,000 acres were sold, but in the three years since then, they had sold about 600,000 acres for the handsome sum of $1,600,000. Of this amount the colony at Greeley had purchased 70,000 acres, and several more similar sales were in process of accomplishment.

While on the way through this region, uninhabited save by hostile Indians and buffaloes, telegrams were frequently received announcing the capture of Louis Napoleon and other startling European events, apparently before their occurrence. Outside the car was a wide, extended, desolate plain, with not a tree for hundreds of miles; within the car were nearly every variety of meats, game, wines, vegetables, fruits, pastry and cigars, daintily served up by colored servants in livery to delighted guests scudding along at the rate of thirty miles an hour. Without the railroad there would be nothing but starvation and barbarism; with it and upon it the excursionists enjoyed peace, plenty and the fat of every land.

At Kiowa station, 31 miles from Denver, the forethought of some one,—Superintendent Anderson, we suspect—had provided two "observation cars," which, placed in front of the locomotive, afforded the guests a never-to-be-forgotten view of one of the most glorious sunsets that ever gilded the skies even of Colorado. In front were the chief ranges of the Rocky Mountains, with Gray's Peak in the center, Long's Peak on the right, and Castle and Pike's Peaks on the left. Upon the extreme left, and at the incredible distance of two hundred miles, were the Spanish Peaks, which separate the waters of the Arkansas from the Rio Grande. But except these mountains all was a desolate rolling wilderness of plain lighted up, however, by such a sunset as is seldom witnessed elsewhere.

The party were handsomely received at Denver on the 3d inst. with music, and the freedom of the city was tendered to the guests. On the 4th the run was made to Cheyenne and back over the Denver Pacific, which follows the course of the mountains twelve or fifteen miles east of their base; a short, but gratifying stop being made at Greeley, the celebrated colony of the National Land Company. Cheyenne is practically the terminus of the Kansas Pacific Railway, the stock of the Denver Pacific being controlled by the former company, so that there is but one line, and that a magnificent one of 740 miles in length from Kansas City to Cheyenne.

Denver is a finely built city of about 7,000 inhabitants and presents a surprising appearance of substantiality, growing up as it has done isolated by hundreds of miles from any other city or civilized community. It lies on the plain twelve miles east of the Rocky Mountains, which are of course in full sight, and add unspeakably to its beauty; is on the South Fork of the Platte, and elevated about 5,100 feet above tide water. After the return of the party from the mountains on the 8th a banquet was given by the citizens of Denver, at which Gov. McCook, Ex. Gov. Evans, P. M. G. Cresswell, President Perry, Wm. Prescott Smith and others spoke, giving and receiving welcome. It was evident that the road was popular with the patrons along its line, and particularly with the residents of Denver and Cheyenne. More public spirit than was shown by the Denverites, or a more hospitable reception it would be impossible to find.

Leaving Denver on the 8th the return was quickly made, fourteen of the party stopping at Fort Hays by invitation of Gen. Custar, to shoot buffalo and Arapahoes. Arriving at Kansas City on Saturday noon, at an hour too late to enable the Chicagoans to reach home by Sunday on any regular train, a special engine was afforded by the courtesy of the Hannibal & St. Joseph and Chicago, Burlington & Quincy roads to take up three Pullman cars with fifteen passengers to Chicago, a feat which was accomplished in less than twenty hours. The main party continued their way to St. Louis, which city they reached on Saturday night, fresh from a two thousand mile trip of nearly two weeks' duration.

To speak of the glories of the Rocky Mountains, which were enjoyed by the magnificence of the Kansas Pacific Railroad Company; of the priceless wealth hidden in those greatest of all Nature's monuments; of the sensation experienced in scaling Argentine Mountain, two and a half miles above tide water, where the barometer stands at seventeen inches, and where the snows repose eternally; of the soda springs at Idaho; of the aspirations of Denver and Golden City, which have this very week been tied together by rail; or of the healthful climate and its inducements for those who would become robust; would, and we hope will, fill a volume. We have at present only time and room to append the appropriate resolutions which were unanimously passed before the party broke up on the 9th, Gen. Cresswell in the chair:

Whereas, The guests of the Kansas Pacific Railway Company, on the excursion which started from St. Louis on the 3th ultimo, desire to offer some expression of their appreciation of the ten days' trip which it has been their good fortune to make upon the Company's road through Kansas and Colorado Territory, therefore

Resolved, That we cannot withhold our admiration of the perfect construction and management of a road seven hundred and fifty miles in length, built through a wilderness, exposed, at that time, to constant interruption from savages, and without any of the ordinary aid which nature, almost everywhere else in this country, offers to the building of railroads; and that we frankly and freely declare that in our opinion, formed from careful observation, there is no road more excellent in the United States; and that this long route through the wilderness, now redeemed from savage occupation and opened to civilized settlement, which has already begun to enter upon it, is as safe to travel as the road to Boston Common or New York Central Park.

Resolved, That we can conceive of no enterprise more important to the welfare of the Great West, and consequently to that of the whole country, than that which has thus been so successfully inaugurated by the energies and zeal of the Kansas Pacific Railway Company.

Resolved, That as individuals we cannot refrain from acknowledging the sense of personal obligation we all feel, not only for the kindness and attention we have experienced through the whole tour, but for the incessant and unwearied care which the officers of the Kansas Pacific road and the officers of the National Land Company have taken to give us a full comprehension of the ends and aims of opening this new route to the Pacific and the Southwest, and of the vast resources, mineral and agricultural, of the Territory of Colorado.

Resolved That we owe it to the Kansas Pacific Railway Company, that it has given to us new recollections and associations and stores of knowledge which we cannot fail to cherish and recall with pleasure for the remainder of our lives.

Resolved, That with our faces turned homeward we send back a hearty greeting to our friends of Denver, whose warm kindness, big as their majestic mountains, we shall never forget, and who so fitly closed the celebration of the opening of the road by a banquet, and that we include in this greeting those all along the road at Kansas City, Leavenworth, Lawrence, Topeka and elsewhere, who turned out to greet us; and that more eloquent than any words is that which we have seen—hamlets, centres of busy industries; villages, springing into life with Eastern enterprise; cities built by energy, emulating the East, on the verge of the prairie where the guest looks upward over mountain ranges to that Great West whose possibilities are certain, whose future is swift, and whose present is thick with indications not only of the good time coming, but of the good time already come.

Resolved, That while the capitalists of the East and West, who risked their means in starting this enterprise and pushing it to early completion, deserve praise for their foresight, enterprise and sacrifices, we are glad to observe that the practical operation of the line is in the hands of most efficient and excellent officers, from Superintendent A. Anderson, and his worthy assistant, Col. Noble, to those in the humblest capacity, as shown by the order and regularity witnessed by us at all points on their extended line.

Resolved, That the Kansas Pacific Railway is not only a continuation westward from the Missouri river of the system of railroads that leaves the seaboard at New York, Baltimore and Philadelphia, through Cincinnati, Indianapolis and St. Louis, but at Kansas City and Leavenworth, the great northern lines of the Lake system, joining it from Chicago, afford it the most general and varied connections with the East.

Resolved, That the success of the Kansas Pacific Railway, being dependent, in great measure, on the rapid development of the country it traverses, seems to be strongly aided by the plans and the conduct of its energetic adjunct, the National Land Company, which announces such admirable provision for the transportation and settlement of emigrants on the rich lands of Kansas and Colorado.

Resolved, That the Pullman Palace Car Company have shown in this excursion, as in others, that the difficulties and discomforts of railway locomotion are things of the past. In their spacious and elegantly appointed train we have enjoyed all the comforts and conveniences of a home, while traveling over the plains of Kansas and Colorado. It is due to the Pullman Palace Car Company that railways are thus enabled to carry passengers in a way known nowhere else in the world. It is through the efficiency of its organization only that such excursions as this we have just made are possible, by which a first-class hotel is ready at a day's notice to be put upon wheels and moved from Chicago to any part of the country at the call of the railway companies.

Resolved, That our thanks are due and heartily tendered to the Western Union Telegraph Company, which liberally opened its lines to us for social and family messages, and despatched to us at all available points along the route, the most important news of the day from all parts of the country.

THE TEXAS CATTLE TRADE.

One of the new features of the trade in Texas cattle this season has been the shipments made on the Union Pacific Railroad. For some time past Abilene, a station on the Kansas Pacific 162 miles west of Kansas City, has been the great primary shipping point for Texas cattle, that being the nearest railroad station. The cattle are driven from Texas nearly due north through the Indian Territory and Kansas to this place, the route affording grass and water and reasonable freedom from hostile Indians, and the range being rarely broken by the farms of settlers. It has been generally supposed that the cattle would be driven to the *nearest* station, and that the drovers would surely prefer the shortest route for driving; and the companies building railroads to and through the Indian Territory have looked upon the cattle trade as likely to be their great item of traffic. The Missouri River, Fort Scott & Gulf road has established cattle yards at its terminus, near the northeast corner of the Territory, it has already attracted a considerable traffic by this route, and its officers expect to obtain the largest part of the cattle trade until some railroad approaches nearer Texas.

But the movement to divert this traffic, or a share of it, to the Union Pacific Railroad, is based on the principle that the distance cattle must be driven is altogether a minor consideration. Its promoters claim that good pastures are the important thing, and that it matters little whether the cattle range for three months on a Texas prairie, or graze their way for three months from the Red River to the valley of the Platte, and that they will improve as fast on the slow march as when they graze at will. If this be true, it is perhaps just as well for the herdsman to drive his cattle to the Union Pacific as to the Kansas line.

The experiment has been tried this year. Schuyler, a station on the Union Pacific Railroad 76 miles west of Omaha, was made the point of shipment. Droves amounting in all to nearly 30,000 head were driven from Texas to the Platte valley and shipped eastward at this point, which is 180 miles nearly due north of Abilene. As it is nearly as far from the Chicago market as Abilene, and the rates are likely to be about the same from the two points, it would seem necessary that the additional driving of 180 miles should be absolutely advantageous.

The trade at Schuyler is nearly closed, and the Omaha papers report that it has been truly successful; that those who have driven cattle to that point have been satisfied with their experiment.

While we may hesitate to believe that any considerable proportion of the Texas cattle will be driven to Nebraska, simply for shipment, it is altogether probable that a very large number will be driven to that State to be fattened. A large part of the area of the State is not likely to be cultivated for many years to come, but this almost illimitable expanse of grassy plain can be made immediately available as pasture. And this is true of Kansas as well as Nebraska. Herds driven to the unoccupied parts of these States in light condition, in a few months can be prepared for market almost without cost. Then, whether they are in the valley of the Arkansas, the Kaw, the Solomon, the Republican, the Platte, or the Elkhorn, they can be driven to a station in a few days and shipped in good condition.

If no deterioration is caused by driving, we might expect the cattle to be driven just as far as they could find range, and then the shipping points would be likely to be near the centre of Missouri, on the Pacific of Missouri and the South Pacific. It is significant that these cattle have always been driven to the nearest accessible railroad station. This, we believe, will be true hereafter, and when railroads are completed to Northern Texas we expect that very few cattle will be driven across the Indian Territory, except stock cattle to be fattened on Northern prairies, and it is at least doubtful whether these will not make the largest part of their journey by rail. Traveling may keep cattle healthy, but it will hardly make them fat.

THE INDIANAPOLIS, BLOOMINGTON & WESTERN RAILWAY.

The opening of the entire line of this road from Indianapolis to Pekin, a distance of 205 miles, was celebrated last Tuesday by an excursion from Indianapolis to Peoria and return. A train of seven coaches with 225 guests, many of them prominent railroad men and journalists, left Indianapolis at 7 a. m., ran through to Peoria, and returned the next day. Some time ago we announced the opening of the line from Danville to Pekin. At that time a section of the eastern end was in operation from Indianapolis to Crawfordsville, but since that time the gap between Crawfordsville and Danville has been filled, including a bridge over the Wabash River, and the line is now in full operation.

This road is not the most direct line between its termini, but seems to have been located with a view to the traffic of the larger towns of the section through which it runs. It is essentially an east and west road, dividing the territory between the Toledo, Peoria & Warsaw road on the north and the Toledo, Wabash & Western on the south. This territory it divides diagonally, approaching within ten miles of the former at Pekin and crossing the latter at Danville. From Bloomington westward most of the way to Pekin the Jacksonville Division of the Chicago & Alton road is close to it, while the Toledo, Peoria & Warsaw is from ten to twenty miles north of it. Thence to Urbana it has a wide district on each side of

it. From Urbana to Danville it is everywhere quite near to the line of the Toledo, Wabash & Western road. From Danville to Indianapolis it has a good territory on each side for most of the distance, though near Indianapolis the country is so divided by railroads that there is no very heavy traffic for any new one.

Few Western railroads have so many large towns on their line. Beginning with Indianapolis the only other considerable place on the road in Indiana is Crawfordsville. In Illinois, Danville, Urbana (including Champaign), Bloomington and Pekin are among the most prosperous and promising towns in the State. Then, too, a connection will be made with Peoria, the chief town on the Illinois River and the third city of the State. It has, moreover, a country on its line unsurpassed for fertility in Illinois. There is very little waste land, the country is well settled and well cultivated, although it has room for many more farmers and an enormous area which has never known the plow.

It is but lately that these east and west roads crossing the State south of Chicago have given promise of profit. The heavy produce of the State, not only the grain but the cattle, has sought Chicago. The cheap transportation of the lakes was thought indispensable for grain, and the cattle have gone to the nearest great cattle market. But modern improvements in transportation have made it possible for railroads to carry grain from the place of production in the West to the place of consumption in the East. For this traffic these roads offer the best facilities. The distance from New York to Danville is exactly the same as the distance from New York to Chicago. So the distance by the Indianapolis, Bloomington & Western road to New York is 33 miles less from Peoria, 43 miles less from Pekin, 45 miles less from Bloomington, 94 miles less from Champaign, and (until the Chicago & Danville road is built) 162 miles less from Danville than from Chicago. Many of these distances are inconsiderable, yet the road will be able, doubtless, to obtain a share of the traffic which the Illinois Central, the Chicago & Alton, and the Chicago Rock Island & Pacific roads have hitherto taken to Chicago.

We have heretofore announced the fact that trains will run regularly from Cincinnati to Council Bluffs by way of this road. Its terminus at Indianapolis enables it to carry freight and passengers on their way to the South and Southeast, the North and Northeast, as well as to the East, and this Cincinnati line indicates that it may find a considerable traffic as a connection between Central Illinois and the Ohio valley cities.

This new road is understood to be in close connection with the system of railroads of the Pennsylvania Railroad Company. Benj. E. Smith and Wm. Dennison, Jr., of the Columbus, Chicago & Indiana Central Railway directors, are among its directors.

The Chicago & Iowa Railroad.

It is now fully decided that the Chicago & Northwestern will have no part in the management of this line The Oregon *Reporter* of the 8th says:

"We learn that it was the intention to have re-commenced laying iron on the Oregon & Rochelle Railroad the present week, but that the unexpected and almost unprecedented action of the Northwestern Company has rendered it for the present impossible. About 500 tons of iron having recently arrived in Chicago for the road, and application having been made by Mr. Hinckley to the Northwestern to transport it to Rochelle, that company at once despatched a corps of laborers to the latter place with orders to take up the switch uniting the two roads, and to completely destroy the connection This order was executed on Saturday last. The switch-rail was removed by the workmen, and so much of the track of the Oregon & Rochelle road as rested upon the Northwestern grounds, the embankment was levelled down, and the fence rebuilt between the two roads."

The Oregon & Rochelle road is to form a link in the Chicago & Iowa line. Since the severance of the connection with the Northwestern, it has been decided to first build the line between Aurora and Rochelle, and grading is now progressing at Aurora and several other points on the line, in charge of John E. Blunt, Chief Engineer. This section of the road, 42 miles long, the managers confidently expect to complete this year.

The route from Rochelle westward is not absolutely determined. It had been intended to cross the Mississippi in the vicinity of Thompson, south of Savanna, in order to form a connection with the Iowa Midland; but that road, apparently, has been captured recently by the Northwestern. The Chicago & Iowa, however, has finally secured a combination with the projected road from Dubuque down the Mississippi on the Iowa side and also with the proposed Dubuque & Minnesota Railroad, or Turkey River Valley line. These will be exceedingly valuable lines, being well located and sure to secure a heavy traffic.

We learn that it is possible that an agreement will be made with the Chicago & Rock River Company, by which lines will not be so constructed as to conflict with each other.

It is proposed to construct the eastern division, from Aurora to Joliet, by way of Lockport.

We are informed that New England capitalists have taken nearly a million of dollars of the bonds of the company, and that nothing now seems to stand in the way of the rapid construction of the line.

Canadian Prosperity.

In the course of an article on the distances between Chicago and New York, especially by the Grand Trunk Railway, we mentioned incidentally that "If in any way Canada and its cities can be made populous and flourishing, and a heavy trade instituted between them and the West, the Grand Trunk Railway will be sure to have a very large traffic," etc. Quoting this article, Herapath's (London) *Railway Journal* speaks of this paragraph as a sneer at Canadian progress. Certainly nothing of the kind was meant. What we intended to assert was the very well understood fact that Canada, however rapidly it may have grown and however much it may have been improved, is still a thinly peopled country, affording to the Grand Trunk Railway a very thin traffic per mile of road, and that if in any way that colony and its cities could be made populous and flourishing, the traffic of the road would be greatly increased. Canada is growing, but considerable sections of it at the extremity of the Grand Trunk Railway grow quite slowly. The Grand Trunk gains part of its traffic from the country on its line, and another part from the Western States. When Canada has twice its present population, these Western States will have very much larger dealings with the Dominion, and most of the traffic between Western and Canadian cities must pass over the Grand Trunk. It has, and doubtless will continue to have, a share of the traffic between the West and New England cities, especially Boston and Portland, but as it is the longest line and in winter the most uncertain, it is only reasonable to suppose that its share in this traffic must remain comparatively small. On the other hand it may have almost a monopoly at full rates of business between the West and the Canadian cities east of Hamilton.

The Pullman Cars in America.

We find in a late number of the London *Engineer*—an authority on engineering matters—the following paragraph, which indicates that it is *not* an authority on American railroad news:

"The Pullman Palace cars have been withdrawn from the American railroads, the habits of the traveling public not permitting their continued use."

In order to say something equally probable and equally truthful of English railroads, we insert the following paragraph:

"Locomotive engines have been withdrawn from the English railroads, the habits of the traveling public not permitting their continued use."

Instead of being withdrawn from American railroads, *The Engineer* should know, they have been adopted upon almost every important line in the country, and the "habits of the traveling public" are exactly what have made possible (and profitable) these luxurious cars and render it very difficult for lines without Pullman cars, or others similar in elegance, to obtain any considerable share of travel.

REGISTER OF EARNINGS.

FOR THE MONTH OF AUGUST.

Michigan Central (404 miles), 1870		$378,880 65
" " (329 miles), 1869		353,569 04
Increase (7 per cent.)		$25,311 61
Marietta & Cincinnati (377 miles), 1869		$129, 96 00
" " (377 miles), 1870		118,407 00
Decrease (8¼ per cent.)		$10,689 00
Ohio & Mississippi (393 miles), 1870		$300,971 00
" " (340 miles), 1869		275,220 00
Increase (9¼ per cent.)		$25,751 00
Central Pacific (890 miles), 1870		$806,040 00
" " (690 miles), 1869		511,854 00
Increase (57½ per cent.)		$294,186 00
Des Moines Valley (244 miles), 1870		$83,871 29
" " (162 miles), 1869		63,' 42 94
Increase (32 per cent.)		$20,328 35

FOR THE FIRST WEEK IN SEPTEMBER.

Michigan Central (424 miles), 1870		$96,896 68
" " (329 miles), 1869		88,923 41
Increase (9 per cent.)		$7,973 27
Milwaukee & St. Paul (936 miles), 1870		$259,32' 00
" " (825 miles), 1869		212,911 00
Increase (22 per cent)		$46,816 00
North Missouri (476 miles), 1870		$77,598 00
" " (404 miles), 1869		63,189 00
Increase (22¾ per cent.)		$14,409 00
Chicago & Alton (431 miles), 1869		$125,139 93
" " (465 miles), 1870		123,435 34
Decrease (1½ per cent.)		$1,7'4 60
St. Louis & Iron Mountain (310 miles), 1870		$32,845 00
" " " (310 miles), 1869		20,360 18
Increase (61½ per cent.)		$12,484 82

Chicago Railroad News.

The General Agents' Excursion.

The morning trains on all the three lines which run trains between Chicago and Council Bluffs were considerably lengthened last Monday by the addition of cars for the accommodation of the general freight, ticket and passenger agents and their ladies, on their way to the Pacific coast. These occupied two Pullman coaches on each of the lines, and the train on the Burlington road had also a special car of the Central Pacific Railroad, occupied by Vice-President Huntington and a small party. Nearly 150 excursionists were on these three trains, nearly half of whom were ladies, the agents generally taking their wives and some who had no wives their sisters, and some who had no sisters, other men's sisters. There were not many freight agents among them. Nearly all the general ticket agents of this city were of the party. Altogether they formed as pleasant a party as is often seen, all apparently, so fully determined to enjoy their journey that nothing less than an earthquake or a collision or some such convulsion could frighten them out of their good humor.

The excursionists reached Omaha Tuesday morning and left that afternoon in a train of fine Pullman sleeping coaches, the "San Francisco," "Vermont," "Sacramento," "Wyoming," and "Colorado." It brought them to Cheyenne by ten the Wednesday morning. There the train switched off to the Denver Pacific and ran to Denver. There a ball was given in honor of the party in the evening. Thursday the party was taken back to Denver and resumed their journey westward. They were to reach Salt Lake City Friday and San Francisco Sunday.

The train started from Omaha in charge of Francis Colton, General Ticket Agent of the Union Pacific Railroad, who issued the invitations to the excursionists, and who, therefore, may be regarded as their host. He was compelled to leave them and return to Omaha before reaching Cheyenne, much to the regret of the party, which was informed thereof by a telegram Wednesday morning, he having left during the night. The following neat reply was telegraphed back to him by Thomas L. Kimball, General Western Passenger Agent of the Pennsylvania Railroad:

"Mr. Colton, we received your morning salute by lightning, and, with loud regrets for your absence, we unanimously wish that he who rides and runs away, may live to ride another day. Thos. L. Kimball, for the party."

Thereafter the train was in charge of Beverly R. Keim, the lately appointed Assistant General Passenger Agent of the Union Pacific.

Lake Shore & Michigan Southern.

There is a change in the running of trains on the Kalamazoo Division. Passengers leave Chicago, as heretofore, at 11:30 a. m., but reach Kalamazoo at 5:30 p. m. instead of 6:05, and Grand Rapids at 8:15 instead of 9:25 p. m. The night express, leaving Chicago at 9 p. m., reaches Kalamazoo at 7:10 a. m., and Grand Rapids at 10:20, instead of 6:50 and 10:20 as heretofore.

Chicago, Rock Island & Pacific.

The Davenport *Gazette*, in the course of an article intended to set forth the advantages to the city of railroads and railroad shops, gives the following table of the number and wages of the employes of the Chicago, Rock Island & Pacific Railroad at that place:

Department.	Grade.	Married.	Single.
Car Shop	Mechanics	27	1
Machine shop	"	26	2
Blacksmith shop	"	24	8
Boiler shop	"	11	3
Roundhouse	Engineers	25	8
"	Firemen	29	4
"	Wipers, etc.	10	8
Freight department	Clerks, etc.	9	7
Trackmen	Laborers	6	3
Coal yard	"	3	2
Grading, etc.	"	90	8
Land department	Clerks, etc.	3	1
Office, telegraph, etc.	"	3	2
Conductors	Iowa Division	16	8
Brakemen	"	44	11
Baggagemen	"	7	5
Laying track	Laborers	20	16
Section men	"	8	2
Total force of Iowa Division here		299	99

"Here, then, we have the figures; now for the facts. The aggregate force employed at the depot, etc., at this date, is 299 married men and 99 who have not yet been made so happy, but who, no doubt, in due time, *will* enlist, etc., in all say four hundred men, to whom is paid monthly $25,000 to $30,000, or about one thousand dollars a day, the bulk of which money is divided up among their fellow-citizens—the landlord, butcher, baker, grocer, farmer, tradesman, doctor, etc., getting a share. Nearly all of these employes make their home in this city. Here, then, we have nearly one-third of a million dollars paid out here annually by *one* railroad company. And to our population is added fifteen or sixteen hundred persons, which in all probability would not be the case if we did not have the road. The figures we have given are rather under than over the average number of employes at this point."

Freight Movement.

For a week past the receipts of grain in Chicago have been light, prices not being satisfactory. But shipments of grain to the East by rail have been remarkably heavy, perhaps heavier than ever before. This is worthy of notice; for the lake will be open for two months to come; rates by water are not high, and rates by rail have been increased lately.

The movement Westward is very heavy, both on the lines to the East and the other roads. Merchandise and lumber

crowd all the cars, and it is not easy to provide rolling stock sufficient for the demand.

Regular rates on live stock are $40 per car to Buffalo, $50 per car to New York, and 30 cents per hundred to Pittsburgh. There are no changes in rates in either direction.

Michigan Central.

This company and the Great Western of Canada have consolidated their Buffalo ticket offices, and now have one under the Mansion House, corner of Main and Exchange streets. It is in charge of L. M. Harper, General Traveling Agent of the two roads for the states of New York and Pennsylvania. Of Mr. Harper, the Buffalo *Commercial Advertiser* says:

"Mr. Harper is an experienced railway man, and has been in the service of the Great Central route for nearly twenty years. What he does not know about the passenger business is hardly worth knowing; and if he cannot give ample and correct information with regard to trains, connections, distances, fares, &c., it is not worth while to search further for it. He is a gentleman whose word is good among railroad men, and the traveling public may rely upon any representations made at his office."

The passenger traffic in this line is extraordinarily heavy. The fast train, which leaves Chicago at 11:20 a. m., has usually seven coaches attached, and the Atlantic express is even larger. The other day the Pacific express started from Detroit with *twelve* coaches, in two sections. This train left Detroit more than two hours behind time, lost considerable time by a train breaking in two between Ypsilanti and Ann Arbor, and yet came into Chicago on time.

The Michigan branches of this line are progressing very favorably. The Kalamazoo & South Haven road will be opened in a few days to Garnett, about 28 miles west of Kalamazoo, where it will cross the Chicago & Michigan Lake Shore road. The Michigan Central will then take possession of this line and operate it. A section of the Chicago & Michigan Lake Shore road from Nunica, on the Detroit & Milwaukee road, northwestward to Muskegon will be opened in a few days, and the section from St. Joseph to Nunica will be completed by the close of the year, thus opening the shortest possible rail route between Chicago and Muskegon. The just completed line of the Grand Rapids & Indiana Railroad, from Kalamazoo to Grand Rapids, though it is so intimately connected with the Fort Wayne road (which operates it), is likely to bring a considerable traffic to the Michigan Central. An agreement has been made by which the Chicago business, freight and passenger, of that part of the line north of Kalamazoo (110 miles now open) will pass over the Michigan Central. The business to New York and the East will pass over the Fort Wayne road. The loop line from Niles to Jackson, which will render the route to Detroit shorter by sixteen miles, is being constructed in the most solid and permanent style and will be completed this season. The Fort Wayne, Jackson & Saginaw road is completed into Fort Wayne and will be open for business before the end of the month, affording a feeder from a large territory heretofore poorly provided with railroad facilities. The Detroit, Hillsdale & Indiana road (completed from Ypsilanti to Saline) is progressing, and in a short time the Michigan Central will have reached nearly every section of the lower peninsula of Michigan with a branch line.

Personal.

Morgan McAllister, conductor of a freight train on the Chicago & Alton Railroad, was instantly killed near Plainview last week by falling between the cars while in motion.

J. Arthur Robbins, the Chicago ticket agent of the Grand Trunk Railway, was married last Tuesday evening to Miss Maggie Owens, daughter of Owen Owens, Esq., of this city.

Removal.

The office of the Great Western Dispatch in this city has been removed from 128 Washington street to the northeast corner of Dearborn and Washington, about twos block east of its old location.

—The committee of the New York Stock Exchange recommended on the 15th inst. that the Union Pacific Railroad Company be placed on the regular call. The following is the official statement of the company: First mortgage 6 per cent. bonds, $27,237,000; United States subsidy bonds, $2,923,651; land grant 7 per cent. bonds, $9,856,000; income bonds, $10,000,000; capital stock issued, $36,745,000; total, $111,074,512. The securities of the North Missouri Railroad Company are to be admitted to the free list.

—The late General Manager of the Great Northern Railway of England, Mr. Seymour Clarke, received a salary of £4,000 per year. At the late meeting of stockholders there was a general complaint that this salary was too much; and it was then announced that his successor was paid £2,500 per year. The directors of the same company authorized to pay the Secretary a salary not greater than £1,000 per year.

—The Greek Government has granted to M. Peat, civil engineer, representing a French company, a concession of a line to run from Corinth and Athens in the direction of the Turkish frontier. From thence the line will probably be extended across Albania so as to join a projected Dalmatian line.

—A Russian railroad last year earned 20 per cent. on its first cost.

The Master Mechanics' Convention.

The sessions of the third annual convention of the American Master Mechanics' Association were commenced last Wednesday morning in the Assembly Buildings, corner of Tenth and Chestnut streets, Philadelphia. We take the following report of the first day's session from the Philadelphia *Evening Telegraph*:

The convention was called to order at 9 o'clock by Mr. H. M. Britton the President of the former convention. Prayer was offered by Mr. Wells, of the Jeffersonville, Madison & Indianapolis Railroad.

The badges of the delegates, a white satin rosette, were distributed by the President to be worn by all members during the entire sessions of the body.

The President read the fourth article of the constitution relating to the qualifications of master mechanics necessary for membership, for the benefit of those who wished to become members.

The proceedings of the previous session were read and approved, after which the roll was called and the members answered to their names.

An opportunity was then given for all lawfully-qualified persons to sign the constitution and become members.

The President read a short address of welcome to the delegates, of which the following is an abstract:

"We are now an organized body, which cannot fail to be productive of good results. The press has recognized us by favorable notices of our meeting, and we have reason to believe that the traveling public recognize us as subservient to their ease, comfort, and safety. The railway companies themselves recognize us as the guardians of their property given to us in trust. Let us feel encouraged in our enterprise, and give ourselves with renewed zeal to the work. Every member should feel it his duty to help the workings of the committees by giving any items of information which may have come within his knowledge. By so doing we may arrive at valuable facts and conclusions relating to the working of railways which could be arrived at in no other way. Some few officers of railways have formed an erroneous impression of the object of our organization. They couple it with trades-unions and like organizations. It should be the duty of each one to try to disabuse the minds of any such of any such idea. Our work is the discovery of everything which may be of use in the management and economy of the roads. Another feature is the social element. We come from all points within the boundaries of the Atlantic and Pacific. We meet in social good will, and have social intercourse. Many of us are accompanied by our wives, whose presence adds much more pleasure.

"Since our last meeting one of our members has died. Mr. George S. Griggs, one of the oldest master mechanics, died of pneumonia. It is hoped that the convention will take some notice of this fact.

"In conclusion, it is urged upon the members to be punctual in attendance at all meetings of the body."

The report of the Secretary was read and approved.

Mr. Dodge, Secretary, offered the following:

The question having been raised as to the propriety of allowing visitors to attend the deliberations of the association, it is moved that the privilege be temporarily accorded each member of inviting such guests as he may elect, and that the subject be referred for final action to a committee upon revision of by-laws. Agreed to.

A reconsideration was moved by Mr. Sellers, of the Des Moines Valley Railroad. Agreed to.

Mr. Sellers then moved that a general invitation be given to all who may be interested in the proceedings to be present. He explained that this was to make it evident to all that the organization has nothing secret in its workings. It has nothing to do with trades unions or their issues. All its actions are for the best interests of the traveling public and the railroads. No other questions are admitted. The proceedings should be perfectly open. The motion was agreed to.

On motion, a committee was appointed to revise some items of the constitution and by-laws, which revision had become necessary on account of the increased size of the body. The President appointed Messrs. Rennie, Brown and Hayes as members of the committee.

The report of the committee appointed at the last convention on boilers and boiler material was then read by the chairman of the committee. The members of the committee were Messrs. Hayes, Anderson and Jauriet.

The report was quite a lengthy but able effort, touching on all points relating to the manufacture. It noticed that the superiority of the English locomotive has been much spoken of. After careful examination it is thought that the English engines would be nothing if taken from the almost perfect road beds of the United Kingdom. It was thought that the American locomotives were much superior to the British, but the roads were much inferior. Our locomotives can do but little in proportion to their worth on such roads. The report was received and the committee discharged.

The hours of meeting were fixed from nine to two daily.

A discussion then took place on the contents of the report on boilers, which was continued at some length.

The report of the Committee on Steel Tires and Axles was called for in order, but by request of the committee the reading was postponed until a future occasion.

The report of the Committee on Cylinders and Stuffing-box Packing was read by the Secretary. After its acceptance a very lengthy discussion took place on the subject. The principal opinions were expressed either in favor of or opposed to what is known as the Dunbar Patent Packing. The Stephens Patent Packing was also discussed. At the conclusion of the discussion

Mr. Griggs, of the Erie Railway, moved that a vote be taken, so as to give an idea of the opinions of all the members of the convention. The vote was counted on the Stephens, the Dunbar patent, and the older fashioned spring packings.

This was opposed on the ground that it was using the convention as a medium for advertising private firms, which should not be done.

It was thought the question should be taken so as to know whether the majority were in favor of any steam packing, or whether they preferred the old spring packing. A motion to this effect was offered as an amendment to the motion of Mr. Griggs. The amendment was not accepted.

Mr. Sellers thought that there was no necessity for such an amendment, as everybody knew that it was generally agreed that the expensive spring packing must be got rid of somehow.

The motion was laid on the table.

The report of the Committee on Boiler Incrustation was called for. The committee stated that they had not been able to get together, but that one of its members, Mr. Towne, had presented a paper on the subject, in the absence of a regular report. The paper was read. The paper advocated the purification of the water as the only means of preventing the evil, with its serious consequences, including that most terrible of all, explosions. The paper was received and placed on the minutes.

The report of the Committee on Safety-valves was presented and read. The report was received and the committee discharged.

The Committee on Smoke-stacks made a short report, which was accepted. The report stated that no change was thought necessary in the construction of this portion of the engine.

The report of the Committee on Boiler Explosions was called for, but by request the reading was postponed until a future time.

The Committee on Dead-weight of Rolling Stock also asked for further time. Agreed to.

The Committee on a Uniform Size of Tires made their report. The tires now in use were in sixty-three sizes. The report was received.

Mr. Burk thought that the subject demanded instant attention, and that a committee should be at once appointed to confer with the locomotive builders. It was an item of great expense to carry over from year to year enough tires to meet the requirements of the various sized rolling stock

Mr. Stchell thought that it was not necessary to appoint a committee to consult with the manufacturers. They would not manufacture anything for which there was no market. All that is necessary is for the master mechanics to agree what they want.

On motion the subject was laid over until the report of the Committee on Tires should be read. Adjourned.

New Railroad Combinations.

Arrangements between the three leading lines of railway from New York city to the West, the Erie, Central and Pennsylvania Railroad companies, are held in abeyance, awaiting certain steps of progress on the part of the several parties.

One of these has just been completed, to wit, the leasing of the Shore Line of Connecticut to the New York & New Haven and Hartford & New Haven companies. The lease is for 99 years at the rate of $100,000 per year, or 8⅓ per cent. on the capital stock of $1,200,000. It is the intention of the lessees to complete the line to a point nearer Newport, requiring the building of some seven or eight miles of new road, from which a direct steamboat line will be established.

In the recent "low fares" controversy, which broke out on the point of Boston rates, the Shore Line Company in some sort joined with the Erie and Pennsylvania companies, as against the Boston & Albany and the New York Central. In all the settlements for tickets sold to or from points West, *via* New York, and East or West to or from Boston, the New England railroads previous to this season have been allowed absolutely $6.75 per passenger, whatever the receipts for through fare may have been. This year the Boston & Albany entering into alliance with the Central with a view to control New England travel to and from the West acted doubtless on a new policy, to wit, of dividing the receipts from passengers according to mileage. The Shore Line route accordingly found its interest in dividing with the rival lines to the West, the Erie and Pennsylvania, according to the receipts per passenger for the joint transportation. The result was a very considerable increase in the through travel over the Shore Line route; half, even more than half, of the Boston passengers to or fro by rail went over that route.

But now the New Haven company, in which Mr. Vanderbilt is a large stockholder, becomes the lessee of the Shore Line route, after having consolidated with the New Haven & Hartford, which is a link in the other and older rail route to Boston, to wit, that *via* Springfield.

Another plan on foot is the lease and control of the New Jersey railroads by the Pennsylvania Company. This is not unlikely to be soon perfected. The basis of the transfer will probably be the guarantee by the lessee of annual 10 per cent. dividends on the New Jersey stocks, besides payment of interest, keeping up the sinking-funds, and generally maintaining the property.

These combinations effected, we shall have three great lines, centering in New York, controlling railway traffic from Boston to the Mississippi Valley and the Rocky Mountains. These companies, if we were to believe the widest of newspaper assertions, are already consolidated. But such is not the case. Consolidation, if it were desirable, would be the work of years.

Meantime it is likely to be true that good accord prevails between the companies. Erie, ceasing to be aggressive, will be protected in its attempt to make money by the traffic over its own road and affiliated roads and steamboat lines in New England. Meantime the public is expected to be liberal with companies furnishing good and swift transportation facilities. So long as no gross extortions are attempted by the companies, (and they will be too wise to attempt such) the various stocks at present paying dividends will continue to do so (and moreover bear periodical watering), while after a time Erie will be able to demonstrate a possibility of dividends.—*The Stockholder.*

The Conductors' Life Insurance Company.

James Marshall, of the Hudson River Railroad, President of the United States and Canada Conductors' Life Insurance Company, has issued the following address to the members of the company, dated New York, September 1:

"In obedience to the constitution of our association, and in pursuance of the action of our last convention, I issue this call for your annual coming together. You are requested to meet in annual convention in the city of Philadelphia, State of Pennsylvania, on Wednesday, October 5, 1870, at 10 o'clock a. m., at Concert Hall. The delegates will make their headquarters at the La Pierre House.

Prosperity in an eminent degree has attended our association ever since its organization at Cincinnati, but never more signally than during the fiscal year just closed. It has steadily and rapidly gained in popular favor, until now it stands forth a marvel of success. There is nothing that can arrest its growth, prosperity and influence, but gross dereliction of duty on the part of its officers and members. The highest anticipations of its founders are being realized in what it has done and is doing for the widows and fatherless children of deceased members, and in manifold other ways that it does good.

Since the organization of our association we have paid out $113,787, at a cost of $46 to each member. Five of the assessments were for amputated arms and legs, being an average of about $2,500 to each case. We have enough money in the treasury to pay the expenses of our association for three years, which is a very satisfactory exhibit. I ask you to examine carefully the statistics accompanying this, compiled from our Secretary's books at Columbus, Ohio.

Duty compels me to call your attention to the fifth article of our by-laws, commonly known as the disability clause, and request that the delegates come fully instructed from their various roads in regard to that article.

We have already demonstrated that our lives are insured, and our families are provided for, when we are called away from our hazardous work at about one-third the cost of any life insurance in the United States.

Let us then go forward in the good work so auspiciously begun. Whenever we can improve upon what has already been so well accomplished, let us do so.

The facilities which it affords the uninsured are such as to leave no excuse for neglecting your duty to yourselves and families. Widows throughout the land, homeless orphans crowding the asylums, are witnesses against the neglect—for you are insuring against poverty and suffering.

The uncertainty of life, the hazardousness of our vocation, no conductor can justify himself in neglecting such favorable means as it affords in placing those dear to him, beyond destitution, knowing as you do, the money goes directly to the widows, and not to agents, or for heavy rents for magnificent offices.

In conclusion, I invoke upon you Heaven's choicest blessings, trusting that the proceedings of our convention may be characterized by harmony and good feeling, and that all its doings may redound to the highest success of our cherished association.

I now submit this my second annual address since our organization at Cincinnati.

NUMBER OF DEATHS AND CLAIMS PAID TO DATE.

[In this table passenger conductors are marked "p" and freight conductors "f."]

Name.	Road.	Cause of Death or Disability.	Amo'nt of assessment.
J. T. O'Brien f.	L. N. & M.	Killed	$796
James Dawson, f.	Erie	"	1,124
C. R. Gillett, f.	Erie	"	1,482
T. N. Corwin, p.	T. W. & W.	Shot by passenger	1,700
E. O. Latharn, f.	C. A. & St. L.	Killed	1,733
P. Thompson, p.	Mich. Cen.	Typhoid fever	2,079
T. J. Oates, p.	M. & C.	Shot by hotel keeper.	2,082
Homer Curtice, p	C. & N. W.	Injuries on train	2,251
John Carbutt, p	Erie	Rupture	2,317
S. Hendershott, f.	C. C. & I. C.	Rheumatism of heart.	2,363
Wm. H. Briggs, p.	L. S. & M. S.	Kidney disease	2,445
O. Henderson, f.	L. S. & M. S.	Dropsy	2,418
C. F. Brown, f.	C. & A.	Abcess of spine	2,414
John Stroup, f.	Pa. R. R.	Apoplexy	2,457
R. G. Hobson, f.	South Side	Killed	2,470
E. M. Gessler, f.	Pa. R. R.	Brain disease	2,502
James Guthrie, f.	B. & O.	Killed	2,551
Geo. A. Knox, f.	L. N. & M.	General debility	2,568
W. R. Coleman, p.	L. N. & M.	Killed	2,680
E. W. Bradley, f.	C. C. & I. C.	Leg amputated	2,463
J. B. Post, f.	M. & Essex	" "	2,622
H. L. Like, p.	M. & St. P.	Consumption	2,626
J. W. Scott, p.	P. F. W. & C.	Softening of brain	2,678
James Gibant, f.	B. & O.	Killed	2,671
G. W. Blackburn, p.	North. Mo.	Lost on burnt steam'r	2,630
John Decker, f.	C. & N. W.	Consumption	2,599
C. F. Arnold, f.	C. & N. W.	Leg amputated	2,602
Theo. Harding, f.	Erie	Killed	2,673
R. C. Sawtell, f.	L. S. & M. S.	"	2,603
J. E. Sands, p.	N. & N. W.	Rupture	2,625
J. P. Wheeler, f.	C. & N. W.	Killed	2,633
J. M. Templin, p.	P. W. & B.	Consumption	2,633
George Mather, f.	Ind. C. & L	Hip crushed	2,230
W. D. Snyder, f.	N. & N. W	Killed by ruffians	2,781
Miles Philips, f.	B. & A.	Killed	2,766
D. Underhill, f.	G. W. Ry.	Quick consumption	2,758
Wm. Speirs, f.	West Pa	Heart disease	2,792
John Corry, p.	Erie	Killed	2,873
M. W. McDonald, p.	E. T. & G. A.	"	2,798
C. S. Gardner, f.	A. & G. W.	Arm amputated	2,868
J. H. Thiell, p.	Harlem	Consumption	2,893
H. B. Ross, p.	Ind. & St. L.	Diabetis	2,917
M. Hatmaker, f.	O. & M.	Killed	2,948
Hugh McEwan, f.	G. W. Ry.	Inflamma'n of lungs.	2,909
P. T. Holland, f.	N. O. & J.	Consumption	2,934
C. W. Baxter, f.	Erie	Killed	2,980
Total of payments on claims			$113,787

The average of payments has been $2,483.73.

There is one assessment in process of collection for the family Edward of C. Akerman of the Central Railroad of New Jersey, who was killed June 28, 1870.

The receipts of the company since its first organization have been $7,784.74, of which $3,899 arose from the fees of one dollar paid by each member, $2,673 from a special assessment, and the remainder from excesses on assessments, interest on deposits, back dues of reinstated members, and donations.

The expenditures for the same time were $4,499.51, $2,220 of which were for the Secretary's salary.

Certificates have been issued to 3,899 members, of whom 540 have forfeited their membership, 138 have withdrawn, 21 have been killed, 25 have died, five have been disabled and paid their insurance, and 3,170 remain members.

The large number of deaths by accident is noticeable as indicating the dangerous character of the occupation. More than half the risks paid (26 out of 51) are deaths and injuries by accidents on duty, and 21 out of 46 deaths are by accident.

Contributory Negligence.

In a case recently tried before the Supreme Court of New York, Judge Grover decided that the refusal of the court below to charge the jury that if the plaintiff, who sued for damages for an injury received at a railroad crossing, in approaching near the crossing, could have seen or heard the approaching train by the exercise of ordinary prudence, and failed to, he was guilty of negligence contributing to the injury, and could not recover. The language of the decision on this point is: "The Court erred in refusing to charge the proposition generally, unless the refusal is understood to have been placed upon the ground that the proposition did not exclude the idea that the plaintiff could not have seen or heard the train to have avoided the danger. If the proposition was so understood, the refusal was not erroneous. But the Court clearly erred in refusing to charge the fourth proposition requested by defendant's counsel. The proposition was simply that the plaintiff was not relieved from ordinary prudence in approaching the crossing by the omission of the defendant to give the signals required by statute. The soundness of this proposition will appear from every well considered case involving the question, as well as from the elementary writers, and the reasons assigned for the rule fixing the right of recovery. So long as it shall be held that contributing negligence of the plaintiff will bar a recovery, it can never be held that the negligence of the defendant will exonerate the plaintiff from observing ordinary prudence, whether such negligence consists of duties enjoined by statute or the common law. It is insisted that the Court had in substance already charged the same proposition. The refusal was not placed on that ground, and the jury were left to infer that the refusal was because the Court held the law to be different. I have examined the entire charge and find nothing therein that will obviate this error."

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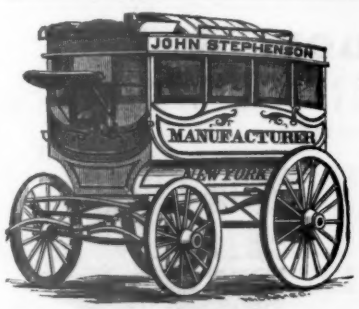

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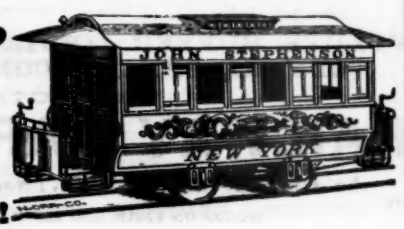

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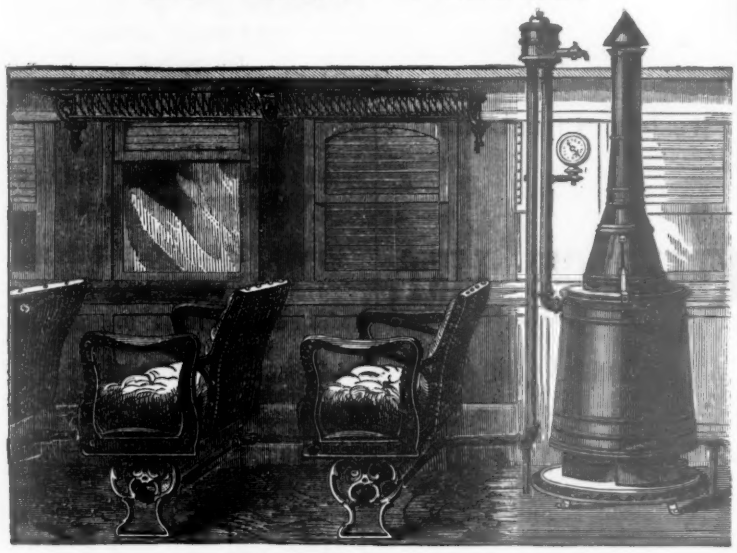

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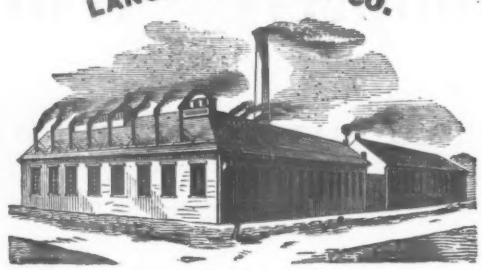

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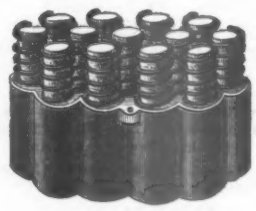

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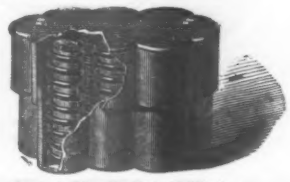

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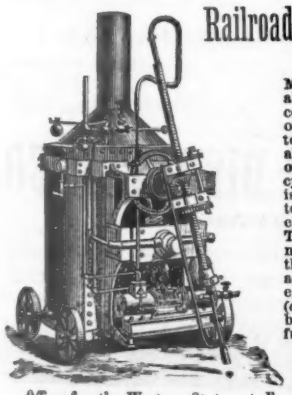

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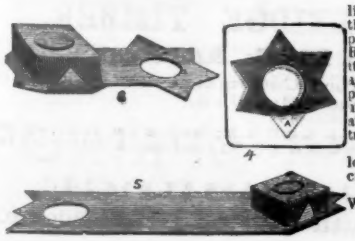

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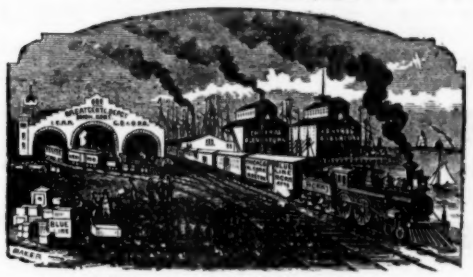
"BLUE LINE."

ORGANIZED JANUARY 1, 1867.

1870.  1870.

OWNED AND OPERATED BY THE

Michigan Central, Illinois Central, Chicago, Burlington & Quincy, Chicago & Alton, Great Western (of Canada), New York Central, Hudson River, Boston & Albany, and Providence and Worcester Railroads.

THE "BLUE LINE" is the only route that offers to shippers of freight the advantages of an unbroken gauge through from Chicago to the Seaboard, and to all Interior Points on the line of Eastern Connections beyond Suspension Bridge and Buffalo. All Through Freight is then transported between the most distant points of the roads in interest,

WITHOUT CHANGE OF CARS!

The immense freight equipment of all the roads in interest is employed, as occasion requires, for the through service of this Line, and has of late been largely increased. This Line is now prepared to extend facilities for the transit and delivery of all kinds of freight in Quicker Time and in Better Order than ever before.

The Blue Line Cars

are all of a solid, uniform build, thus largely lessening the chances of delay from the use of cars of a mixed construction, and the consequent difficulty of repairs, while remote from their own roads. The Blue Line is operated by the railroad companies who own it, without the intervention of intermediate parties between the Roads or Line and the public.

Trains run through with regularity **IN FOUR OR FIVE DAYS** to and from New York and Boston. Especial care given to the Safe and Quick Transport of Property Liable to Breakage or Injury, and to all **Perishable Freight.**

Claims for overcharges, loss or damage, promptly settled upon their merits. Be particular and direct all shipments to be marked and consigned *via*

"BLUE LINE."

☞ *FREIGHT CONTRACTS* given at the offices of the company in Chicago, New York and Boston.

J. D. HAYES, GEN. MANAGER,.. Detroit

C. E. NOBLE,..... } 349 Broadway, N. Y. | P. K. RANDALL, 69 Washington St., Boston
GEO. E. JARVIS,... } | W. W. STREET,.....91 Lake St., Chicago
N. D. MUNSON,.....Quincy, Ill. | J. JOHNSON,..... Cairo, Ill

THOS. HOOPS, GEN. FR'T AGT. Michigan Central Railroad, Chicago.
A. WALLINGFORD, AGT. M. C. & G. W. R. R., No. 91 Lake St., Chicago.
N. A. SKINNER, Freight Agent Michigan Central Railroad.

Empire Line.

THE EMPIRE TRANSPORTATION COMPANY'S

Fast Freight Line to the East

—AND—

TO THE COAL AND OIL REGIONS,

Via Michigan Southern, Lake Shore, and Philadelphia & Erie R. R.'s,

WITHOUT TRANSFER!

Office, No. 72 LaSalle Street, Chicago.

GEO. W. RISTINE, Western Superintendent, Cleveland, Ohio.

W. G. Van Demark,..265 Broadway, New York. | E. L. O'Donnell,.....Baltimore, Md
G. B. McCulloh,....42 South 5th St., Philadelphia. | Wm. F. Smith,.....Erie, Penn

JOHN WHITTAKER, Pier 14 North River, New York.

JOSEPH STOCKTON, Agent, Chicago.

W. T. HANCOCK, Contracting Agent.
WM. F. GRIFFITTS, Jr., Gen. Freight Agent, Philadelphia.

CHICAGO, ROCK ISLAND & PACIFIC RAILROAD.

☞ THE DIRECT ROUTE FOR ☜

JOLIET, MORRIS, OTTAWA, LASALLE, PERU, HENRY, PEORIA,

Lacon, Genesco, Moline,

ROCK ISLAND, DAVENPORT,

Muscatine, Washington, Iowa City,

GRINNELL, NEWTON, DES MOINES,

COUNCIL BLUFFS & OMAHA!

Connecting with Trains on the Union Pacific Railroad, for

Cheyenne, Denver, Central City, Ogden, Salt Lake, White Pine, Helena, Sacramento, San Francisco,

And Points in Upper and Lower California; and with Ocean Steamers at San Francisco, for all Points in **China, Japan, Sandwich Islands, Oregon and Alaska.**

☞ TRAINS LEAVE their Splendid new Depot, on VanBuren Street, Chicago, as follows:

	Leave.	Arrive.
PACIFIC EXPRESS, (Sunday excepted)	10.00 a. m.	3.35 p. m
PERU ACCOMMODATION, (Sundays excepted)	5.00 p. m.	9.50 a. m
PACIFIC EXPRESS, (Saturdays excepted,)	10.00 p. m.	[Mon. ex. 6.00 a. m

ELEGANT PALACE SLEEPING COACHES!

Run Through to Peoria and Council Bluffs, Without Change.

☞ Connections at LA SALLE, with Illinois Central Railroad, North and South; at PEORIA, with Peoria, Pekin & Jacksonville Railroad, for Pekin, Virginia, &c.; at PORT BYRON JUNCTION, for Hampton, LeClaire, and Port Byron; at ROCK ISLAND, with Packets North and South on the Mississippi River.

☞ **For Through Tickets,** and all desired information in regard to Rates, Routes, etc., call at the Company's Offices, No. **37** South Clark Street, Chicago, **413** California Street, San Francisco, or **257** Broadway, New York.

A. M. SMITH, Gen. Pass. Agent. **HUGH RIDDLE, Gen. Supt.** **P. A. HALL, Asst. Gen. Supt.**

Leavenworth, Lawrence,

— AND —

GALVESTON R. R. LINE,

OF KANSAS.

Two Distinct Lines of Road from Kansas City, Mo., and Lawrence, Kan.,

Uniting at OTTAWA, and from thence as a Trunk Line to

INDIAN TERRITORY.

The SHORTEST and ONLY DIRECT ROUTE to the celebrated Neosho and Verdigris Valleys of Kansas, and will be opened for business to the Border of Indian Territory, by Nov. 1st, 1870.

☞ **FIVE DAILY TRAINS, Each Way,** connecting at LAWRENCE with trains the KANSAS PACIFIC ROAD, for WEST and NORTH and at KANSAS CITY with ALL ROADS FOR THE EAST and NORTH, at end of Track with Kansas Stage Co.'s Line of Coaches for all parts of

INDIAN TERRITORY, TEXAS & NEW MEXICO.

☞ **Ask for Tickets via L. L. & G. R. R.,** for all points in Southern Kansas. Freight taken from any part of the East to end of track WITHOUT BREAKING BULK.

CHAS. B. PECK, Gen. Freight and Ticket Agent, Lawrence, Kan.

M. R. BALDWIN, Superintendent, Lawrence, Kan.

CHAS. J. PUSEY, **P. O. Address—Box 5222.** EDW'D H. PARDEE.

Pusey & Pardee,

74 BROADWAY, NEW YORK.

American and English Rails,

LOCOMOTIVES AND CARS FISH-PLATES, SPIKES, &c.

—SOLE AGENTS FOR—

Atkins Brothers' Pottsville Rolling Mills, and G. Buchanan & Co., of London.

☞ Special attention given to filling orders for small T and **STREET RAILS,** of every weight and pattern.

OLD RAILS BOUGHT OR RE-ROLLED, AS DESIRED.

J. E. FRENCH. W. S. DODGE. D. W. CROSS.

Winslow Car Roofing Company.

PATENT IRON CAR ROOFS.

Established, 1859.

No. 211 Superior St. **CLEVELAND, O.**

Over 20,000 Cars covered with this Roof! We claim that these Roofs will keep Cars dry, and will last as long as the Cars they cover without any extra expense after once put on.

☞ Send for Circulars.

Milwaukee & St. Paul R. W.

THE ONLY ALL RAIL LINE TO

ST. PAUL AND MINNEAPOLIS!

AND ALL PORTIONS OF

Wisconsin, Minnesota & Northern Iowa.

PURCHASE TICKETS VIA MILWAUKEE.

Passengers Going via Milwaukee,

Have Choice of Seats in Clean Coaches, and on Night Trains, a full night's rest in Palace Sleeping Cars.

☞ BAGGAGE CHECKED THROUGH BY THIS ROUTE ONLY! ☜

PASSENGERS FROM CHICAGO can obtain these Advantages only by the MILWAUKEE DIVISION of the CHICAGO & NORTHWESTERN R'Y.

SPECIAL NOTICE.—Passengers destined to any place in Wisconsin, Minnesota, or Northern Iowa, either on or off the Lines of this Company, who cannot procure Through Tickets to their destination, should purchase their Tickets **TO MILWAUKEE,** as this is the Great Distributing Point for these States.

A. V. H. CARPENTER, Gen. Pass. Agt. Milwaukee.

S. S. MERRILL, Gen. Manager, Milwaukee.

KANSAS PACIFIC RAILWAY.

Great Smoky Hill Route,

Now Completed and Open for Business Through to

DENVER, COLORADO,

There Connecting with the DENVER PACIFIC RAILROAD for CHEYENNE, forming, in Connection with the UNION and CENTRAL PACIFIC RAILROADS, another ALL-RAIL ROUTE to

CALIFORNIA, NEVADA, UTAH, MONTANA

WYOMING, COLORADO, &C.

The most available Passenger and Freight Route to Lawrence, Topeka, Junction City, Abilene, Salina, Hays, KIT CARSON, River Bend, DENVER, CHEYENNE, OGDEN, SALT LAKE CITY,

Sacramento, and San Francisco.

☞ Close Connections are made in Union Depots at KANSAS CITY and STATE LINE with Express Trains of the Hannibal & St. Joseph, North Missouri and Missouri Pacific Railroads.

Southern Overland Passenger and Mail Coaches leave Kit Carson daily for Pueblo, Trinidad, Fort Union, Santa Fe, &c.

Hughes & Co.'s Splendid Concord Coaches leave Denver daily for Central City, Georgetown, &c.

Passenger and Freight Rates always as low and conveniences as ample as by any other Route.

PULLMAN'S PALACE CARS ACCOMPANY NIGHT EXPRESS TRAINS.

Through Tickets can be obtained at all principal ticket offices. Be careful to ask for tickets via Kansas Pacific Railway, "Smoky Hill Route."

5,000,000 Acres of Farming Lands For Sale!

Situated along the line of this Great National Railway. For particulars, address JNO. P. DEVEREUX, Land Commissioner, Lawrence, Kansas.

R. B. GEMMELL, Gen. Freight & Ticket Agt. **A. ANDERSON, Gen. Supt.**

THE ERIE & PACIFIC DISPATCH CO.

Are Authorized Freight Agents.

For information, Contracts, and Bills of Lading, apply at their office, **64** Clark Street, Chicago.

H. H. RAPP, AGT.

MARSH & GOODRIDGE.
256 So. WATER St. CHICAGO.

Dealers in

R. R. Cross-Ties, Telegraph Poles,

FENCE POSTS, BRIDGE TIMBER,

Piles, Hard-wood Plank, &c., &c.,

To which the Attention of Railroad Contractors and Purchasing Agents is respectfully called.

REFER TO:—Jas. M. Walker, Chicago, Pres't L. L. & G. R. R.; Jas. E. & Wm. Young, Chicago, Railroad Builders; H. J. Higgins, Purchasing Agent C. B. & Q. R. R.; and Railroad Officers and Purchasing Agents generally.

MARSH & GOODRIDGE,

256 South Water St., Chicago.

CHICAGO & NORTHWESTERN R. W.

Comprising the PRINCIPAL RAILROADS from CHICAGO Directly NORTH NORTH-WEST and WEST.

ALL RAIL TO THE PACIFIC OCEAN!

Great California Line.

TRAINS LEAVE WELLS STREET DEPOT AS FOLLOWS:

8:15 A. M. Cedar Rapids Pass | **9:15 P. M. Night Mail.**
10:30 A. M. Pacific Express. | **9:15 P. M. Rock Island Pass.**
10:30 A. M. Rock Island Exp. | **4:00 P. M. Dixon Passenger.**

For Sterling, Rock Island, Fulton, Clinton, Cedar Rapids, Boone, Denison, Missouri Valley Junction, Sioux City, Council Bluffs and Omaha, there connecting with the

UNION PACIFIC R. R.

For Cheyenne, Denver, Ogden, Salt Lake, the White Pine Silver Mines, Sacramento, San Francisco, and all parts of Nebraska, Colorado, New Mexico, Arizona, Wyoming, Montana, Idaho, Utah, Nevada, and the PACIFIC COAST.

FROM CHICAGO	Hours.	1st Class Fare.	FROM CHICAGO	Days.	1st Class Fare.
To OMAHA,.....	23	$20.00	To SACRAMENTO,.	4½	$118.00
" DENVER,.....	52	70.75	" SAN FRANCISCO,	5	118.00

TRAINS ARRIVE:—Night Mail, **7.00** a. m.; Dixon Passenger, **11.10** a. m.; Pacific Express, **3:50** p. m.; Rock Island Express, **3:50** p. m.; Cedar Rapids Passenger, **6:50** p. m.

FREEPORT LINE.

9.00 A. M. & 9.45 P. M. For Belvidere, Rockford, Freeport, Galena, Dunleith, and St. Paul.
4.00 P. M., Rockford Accommodation.
5.30 P. M., Geneva and Elgin Accommodation
6.10 P. M., Lombard Accommodation.
5:50 P. M., Junction Passenger.

TRAINS ARRIVE:—Freeport Passenger, **2:30** a. m., **3:00** p. m.; Rockford Accommodation, **11:10** a. m.; Geneva and Elgin Accommodation, **8:45** a. m.; Junction Passenger, **8:10** a. m.; Lombard Accommodation, **6:50** a. m.

WISCONSIN DIVISION.

☞ Trains leave Depot, cor. West Water and Kinzie Sts., daily, Sundays excepted, as follows:

10.00 A. M. **DAY EXPRESS,** for Janesville, Monroe, Whitewater, Madison, Prairie du Chien, Watertown, Minnesota Junction, Portage City, Sparta, La Crosse, St. Paul, and ALL POINTS ON THE UPPER MISSISSIPPI RIVER; Ripon, Berlin, Fond du Lac, Oshkosh, Neenah, Appleton, and Green Bay.
3.00 P. M., Janesville Accommodation.
5.00 P. M. **NIGHT EXPRESS,** for Madison, Prairie du Chien, Watertown, Minnesota Junction, Portage City, Sparta, La Crosse, St. Paul, and ALL POINTS ON THE UPPER MISSISSIPPI RIVER; Ripon, Berlin, Fond du Lac, Oshkosh, Menasha, Appleton, Green Bay, and THE LAKE SUPERIOR COUNTRY.
5.30 P. M., Woodstock Accommodation.
6:20 P. M., Barrington Passenger.

TRAINS ARRIVE:—**5:30** a. m., **7:45** a. m., **10:10** a. m., **1:00** p. m. and **7:15** p. m.

MILWAUKEE DIVISION.

MILWAUKEE MAIL,	**8:00 A. M.**
EXPRESS, (ex. Sun.) Waukegan, Kenosha, Racine and Milwaukee,	**9:45 A. M. 5:00 P. M.**
EVANSTON PASSENGER,	**11:40 A. M.**
HIGHLAND PARK PASSENGER,	**1:15 P. M.**
MILWAUKEE ACCOMMODATION, with Sleeping Car attached,	**11:00 P. M.**
EVANSTON ACCOMMODATION, (Daily,) from Wisconsin Div. Depot,	**1:30 P. M.**
KENOSHA ACCOMMODATION, (Sundays excepted) from Wells St. Depot,	**4:15 P. M.**
AFTERNOON PASSENGER, from Milwaukee Div. Depot,	**5:00 P. M.**
WAUKEGAN ACCOMMODATION, (except Sundays) from Wells St. Depot,	**5:25 P. M.**
WAUKEGAN PASSENGER, (Sundays excepted) from Wells St. Depot,	**6:15 P. M.**

TRAINS ARRIVE:—Night Accommodation, with Sleeping Car, **5:00** a. m.; Day Express, **4:10** p. m. Milwaukee Mail, **10:10** a. m.; Afternoon Passenger, **8:00** p. m.; Waukegan Accommodation, **8:25** a. m.; Kenosha Accommodation, **9:10** a.m.; Evanston Accommodations, **1.40** and **4.00** p. m.; Waukegan Passenger, **7:55** a. m.; Highland Park Passenger, **3.45** p. m.

PULLMAN PALACE CARS ON ALL NIGHT TRAINS.

THROUGH TICKETS Can be purchased at all principal Railroad Offices East and South, and in Chicago at the Southeast corner of Lake and Clark Streets, and at the Passenger Stations as above.

H. P. STANWOOD, Gen. Ticket Agt. — **GEO. L. DUNLAP,** Gen'l Supt.

Pan-Handle
—AND—
Penn'a Central Route East!

☞ SHORTEST AND QUICKEST ROUTE, VIA COLUMBUS, TO ☜

PITTSBURGH, BALTIMORE, PHILADELPHIA & NEW YORK

On and after Saturday, JULY 10th, 1870, Trains for the East will run as follows:

[DEPOT CORNER CANAL AND KINZIE STS., WEST SIDE.]

8:10 A. M. DAY EXPRESS.

[SUNDAYS EXCEPTED.] Via Richmond. Arriving at

COLUMBUS....	2:35 A. M.	HARRISBURG..	10:35 P. M.	NEW YORK....	6:40 A. M.	WASHINGTON..	5:50 A. M.
PITTSBURGH..	12:00 M.	PHILADELPHIA	3:10 A. M.	BALTIMORE....	2:30 A. M.	BOSTON.....	5:05 P. M.

7:40 P. M. NIGHT EXPRESS.

[SATURDAYS EXCEPTED.] Arriving at:

COLUMBUS..	11:15 A. M.	HARRISBURG..	5:10 A. M.	NEW YORK...	12:10 P. M.	WASHINGTON.	1:10 P. M.
PITTSBURGH..	7:05 P. M.	PHILADELPHIA,	9.35 A. M.	BALTIMORE...	9:00 A. M.	BOSTON.....	11:50 P. M.

Palace Day and Sleeping Cars

Run Through to COLUMBUS, and from Columbus to NEW YORK, WITHOUT CHANGE!

ONLY ONE CHANGE TO NEW YORK, PHILADELPHIA, OR BALTIMORE!

CINCINNATI & LOUISVILLE AIR LINE SOUTH.

42 Miles the Shortest Route to Cincinnati,
18 Miles the Shortest Route to Indianapolis and Louisville.
—FROM ONE TO—

2 Hours the Quickest Route to Cincinnati!

THE SHORTEST AND BEST ROUTE TO

Columbus, Chillicothe, Hamilton, Wheeling, Parkersburg, Evansville, Dayton, Zanesville, Marietta, Lexington, Terre Haute, Nashville,

ALL POINTS IN CENTRAL & SOUTHERN OHIO, & INDIANA, KENTUCKY & VIRGINIA.

— QUICK, DIRECT AND ONLY ALL RAIL ROUTE TO —

New Orleans, Memphis, Mobile, Vicksburg, Charleston, Savannah,

AND ALL POINTS SOUTH.

Cincinnati, Indianapolis and Louisville Trains run as follows:

THROUGH WITHOUT CHANGE OF CARS!

8:10 A. M. (Sundays excepted) Arriving at		7:40 P. M. (Saturdays excepted.) Arriving at	
LOGANSPORT	1:15 P. M.	LOGANSPORT	1:30 A. M.
KOKOMO	2:33 P. M.	KOKOMO	2:45 A. M.
CINCINNATI	9:30 P. M.	CINCINNATI	10:30 A. M.
INDIANAPOLIS	5:00 P. M.	INDIANAPOLIS	5:40 A. M.
LOUISVILLE	11:30 P. M.	LOUISVILLE	3:50 P. M.

Lansing Accommodation: Leaves 5:10 P. M. Arrives 8:55 A. M.
Dolton Accommodation: Leaves 10:10 A. M. Arrives 3:25 P. M.

PULLMAN'S PALACE SLEEPING CARS!

Accompany all Night Trains between Chicago and Cincinnati or Indianapolis.

☞ Ask for Tickets via **COLUMBUS** for the East, and via **"The AIR LINE"** for Cincinnati, Indianapolis, Louisville and points South. Tickets for sale and Sleeping Car Berths secured at **95 RANDOLPH STREET, CHICAGO,** and at Principal Ticket Offices in the West and Northwest.

WM. L. O'BRIEN, Gen. Pass. and Ticket Agent, Columbus. — **I. S. HODSDON,** Northwestern Pass. Agt., Chicago.

D. W. CALDWELL Gen Supt. Columbus.

Western Union Railroad.

CHICAGO & NORTHWESTERN DEPOT, CHICAGO. | MILWAUKEE & CHICAGO DEPOT, MILWAUKEE.

THE DIRECT ROUTE!

CHICAGO, RACINE & MILWAUKEE,

— TO —

Beloit, Savanna, Clinton, Pt. Byron, Davenport, Mineral Point, Madison, Freeport, Fulton, Lyons, Rock Island, Sabula, Galena, Dubuque, Des Moines, Council Bluffs,

OMAHA, SAN FRANCISCO

AND ALL PRINCIPAL POINTS IN

Southern and Central Wisconsin, Northern Illinois, and Central and Northern Iowa.

FRED. WILD, Gen. Ticket Agent. — **D. A. OLIN,** Gen. Superintendent.

CRERAR, ADAMS & CO.,

MANUFACTURERS AND DEALERS IN

Railroad Supplies!

—AND—

CONTRACTORS' MATERIAL.

11 and 13 Wells Street,

CHICAGO, ILL.

Manufacturers of IMPROVED HEAD-LIGHTS for Locomotives, Hand and Signal Lanterns, Car and Station Lamps, Brass Dome Casings, Dome Mouldings, Cylinder Heads, and Car Trimmings, of Every Description.

MOORE
Steel Elastic Car Wheel Co.

OF NEW JERSEY.

Proprietors of

MOORE'S PATENT

FOR THE MANUFACTURE OF

ELASTIC CAR WHEELS.

FOR PASSENGER AND SLEEPING COACHES.

Noiseless, Safe, Durable and Economical.

Also, Manufacturers of

CAR WHEELS OF EVERY DESCRIPTION.

H. W. MOORE, President.
JAS. K. FROTHINGHAM, Secretary.
F. W. BLOODGOOD, Treasurer.

Works, cor. Green and Wayne Sts., JERSEY CITY, N. J.
P. O. Address—Box 129, Jersey City, N. J.

American Compound Telegraph Wire.

More than 3000 Miles now in Operation,

Demonstrating beyond question its superior working capacity, and great ability to withstand the elements. For RAILROAD LINES, connecting a single wire with a large number of Stations, and for long circuits, this wire is peculiarly adapted; the large conducting capacity secured by the copper, with other advantages, rendering such lines fully serviceable during the heaviest rains.

Having a core of steel, a small number of poles only are required, as compared with iron wire construction, thereby preventing much loss of the current from escape and very materially reducing cost of maintenance. OFFICE AMERICAN COMPOUND TELEGRAPH WIRE CO.
234 West 29th Street, New York.

BLISS, TILLOTSON & CO., Western Agents,
247 South Water Street, Chicago.

THE FAVORITE THROUGH PASSENGER ROUTE!

Chicago, Burlington & Quincy
RAILROAD LINE.

3 THROUGH EXPRESS TRAINS DAILY!

FROM CHICAGO	Hours.	1st Class Fare.	FROM CHICAGO	Days.	1st Class Fare.
TO OMAHA, - - -	23	$20.00	TO DENVER, - -	2¼	$68.70
" ST. JOSEPH, - -	21	19.50	" SACRAMENTO, -	4½	118.00
" KANSAS CITY, -	22	20.00	" SAN FRANCISCO,	5	118.00

TRAINS LEAVE CHICAGO from the Great Central Depot, foot of Lake Street, as follows:

BURLINGTON, KEOKUK, COUNCIL BLUFFS & OMAHA LINE.

7:40 A. M. MAIL AND EXPRESS, (Except Sunday,) stopping at all stations; making close connections at Mendota with Illinois Central for Amboy, Dixon, Freeport, Galena, Dunleith, Dubuque, LaSalle, El Paso, Bloomington, &c.

10:45 A. M. PACIFIC FAST LINE, (Except Sunday,) stopping at Riverside, Hinsdale, Aurora, Leland, Mendota, Princeton, Buda, Kewanee, Galva, Galesburg, and all Stations West and South of Galesburg.
☞ An ELEGANT DAY COACH and a PULLMAN PALACE DRAWING ROOM CAR is attached to this train daily from Chicago

TO COUNCIL BLUFFS & OMAHA WITHOUT CHANGE!

5.00 P. M. EVENING EXPRESS, (Daily, except Sunday), in direct connection with the celebrated New York and Chicago Lightning Express Trains of all Eastern Lines, for Burlington, Ottumwa, Des Moines, Nebraska City, Council Bluffs, Omaha, and all points West. **Pullman Drawing-Room Sleeping Car** attached to this Train daily from **Chicago to Ottumwa without change!**

11:30 P. M. NIGHT EXPRESS, (Daily, except Saturday,) stopping at all principal Stations between Chicago and Burlington. ELEGANT DAY COACHES, and a **PULLMAN PALACE SLEEPING CAR** are attached to this train from **Chicago to Burlington, without change!** This is the only Route between

CHICAGO, COUNCIL BLUFFS & OMAHA,

— RUNNING THE CELEBRATED —

Pullman Palace Dining Cars!

49 MILES THE SHORTEST ROUTE BETWEEN

Chicago & Keokuk,

And the Only Route Without Ferrying the Mississippi River!

QUINCY, ST. JOSEPH, LEAVENW'TH & KANSAS CITY LINE.

10:45 A. M. PACIFIC EXPRESS, (Daily, except Sunday,) with an Elegant Day Coach and one of PULLMAN'S PALACE SLEEPING CARS attached, running through from Chicago to KANSAS CITY, **Without Change!**

5:00 P. M. EVENING EXPRESS, (Daily, except Sunday,) with **Pullman Palace Drawing Room Sleeping Car** attached, running through from Chicago to QUINCY, WITHOUT CHANGE!

11:30 P. M. NIGHT EXPRESS (Daily, except Saturday,) with **Pullman Palace Sleeping Car** attached from Chicago to GALESBURG: PALACE DAY COACHES from Chicago to QUINCY, **Without Change!**

64 MILES THE SHORTEST AND ONLY ROUTE BETWEEN

Chicago and Kansas City!

WITHOUT CHANGE OF CARS OR FERRY.

115 MILES The Shortest Route bet. Chicago & St. Joseph.

THE SHORTEST, BEST AND QUICKEST ROUTE BETWEEN CHICAGO AND

Atchison, Weston, Leavenworth, Lawrence,

AND ALL POINTS ON THE KANSAS PACIFIC R'Y.

Local Trains Leave { RIVERSIDE & HINSDALE ACCOMMODATION, 7:00 A. M. 1:30 & 6:15 P. M.
MENDOTA PASSENGER ..... 4:15 P. M.
AURORA PASSENGER ..... 5:30 P. M.

Trains Arrive:—Mail and Express, 3:45 p. m.; Atlantic Exp., 4:15 p. m., except Sunday; Night Exp, 9:05 a. m., except Monday; Mendota Passenger, 10:00 a. m.; Aurora Passenger, 8:15 a. m.; Quincy Passenger 7:30 P. M.; Riverside and Hinsdale Accommodation, 6:50 and 9 a. m. and 5:30 p. m., except Sunday.

Ask for Tickets via Chicago, Burlington & Quincy Railroad, which can be obtained at all principal offices of connecting roads, and at Company's office in Great Central Depot, Chicago, at as low rates as by any other route.

ROB'T HARRIS, Gen'l Superintendent, CHICAGO.
SAM'L POWELL, Gen'l Ticket Agent, CHICAGO.
E. A. PARKER, Gen. West. Pass. Agt., CHICAGO

THE GREAT THROUGH PASSENGER ROUTE TO KANSAS

IS VIA THE OLD RELIABLE

HANNIBAL & ST. JOSEPH
SHORT LINE.

Crossing the Mississippi at Quincy and the Missouri at Kansas City on New Iron Bridges; running Three Daily Express Trains, Through Cars and Pullman Sleeping Palaces from Chicago & Quincy to St. Joseph & Kansas City.

The Advantages gained by this Line over any other Route from Chicago, are:

115 MILES THE SHORTEST!

To St. Joseph, Atchison, Hiawatha, Waterville, Weston, Leavenworth,

64 MILES THE SHORTEST!

To Kansas City, Fort Scott, Lawrence, Ottawa,

Garnett, Iola, Humboldt, Topeka, Burlingame, Emporia, Manhattan, Fort Riley, Junction City, Salina, Ellsworth, Hays, Sheridan, Olathe, Paola, Cherokee Neutral Lands, Baxter Springs, Santa Fe, New Mexico, and all Points on the KANSAS PACIFIC, and MISSOURI RIVER, FT. SCOTT & GULF R. R's, with which we connect at Kansas City Union Depot.

THIS BEING THE SHORTEST LINE AND QUICKEST, is consequently the cheapest; and no one that is posted thinks of taking any other Route from Chicago to reach principal points in

Missouri, Kansas, Indian Territory, or New Mexico.

DAILY OVERLAND STAGES from west end Kansas Pacific Railway, for Pueblo, Santa Fe, Denver, and points in Colorado and New Mexico.

This is also a most desirable Route, via St. Joseph, to Brownsville, Nebraska City, Council Bluffs, and Omaha, connecting with the Union Pacific Railroad for Cheyenne, Denver, Salt Lake, Sacramento, San Francisco, and the Pacific coast.

Through Tickets for Sale at all Ticket Offices. Baggage Checked Through, and Omnibus Transfers and Ferriage avoided.

P. B. GROAT, Gen. Ticket Agent. HANNIBAL, MO.
GEO. H. NETTLETON, Gen. Supt. HANNIBAL, MO.

Old, Reliable, Air-Line Route!

CHICAGO, ALTON & ST. LOUIS R. R.

SHORTEST, QUICKEST AND ONLY DIRECT ROAD TO

Bloomington, Springfield, Jacksonville, Alton,

— AND —

ST. LOUIS!

WITHOUT CHANGE OF CARS.

THE ONLY ROAD MAKING IMMEDIATE CONNECTIONS AT ST. LOUIS, WITH MORNING AND EVENING TRAINS

—FOR—

ATCHISON, LEAVENWORTH, KANSAS CITY,

Lawrence, Topeka, Memphis, New Orleans,

And All Points South and Southwest.

☞ TRAINS leave CHICAGO from the West-side Union Depot, near Madison Street Bridge. ☜

EXPRESS MAIL, [Except Sundays]	8:10 A. M.
LIGHTNING EXPRESS, [Except Saturdays and Sundays]	9:50 P. M.
NIGHT EXPRESS, [Daily]	6:00 P. M.
JOLIET ACCOMMODATION, [Except Sundays]	4:40 P. M.
JACKSONVILLE EXPRESS, [Daily]	6:00 P. M.

Trains arrive at Chicago at 8.00 P. M., 8.30 A. M. and 6:00 A. M. Joliet Accom., 9.40 A. M.

This is the ONLY LINE Between CHICAGO & ST. LOUIS RUNNING

Pullman's Palace Sleeping and Celebrated Dining Cars!

BAGGAGE CHECKED THROUGH.

Through Tickets can be had at the Company's office, No. 55 Dearborn street, Chicago, or at the Depot, corner of West Madison and Canal streets, and at all principal Ticket Offices in the United States and Canada. Rates of Fare and Freights as low as by any other Route.

A. NEWMAN, Gen. Pass. Agent. **J. C. McMULLIN, Gen. Supt.**

North Missouri R. R.

PASSENGERS FOR

KANSAS AND THE WEST,

ARE REMINDED THAT

THE NORTH MISSOURI R. R.

— IS —

11 MILES SHORTER than any other Route!

BETWEEN

St. Louis and Kansas City.

15 Miles Shorter between ST. LOUIS and LEAVENWORTH

— AND —

49 MILES SHORTER TO ST. JOSEPH!

THAN ANY OTHER LINE OUT OF ST. LOUIS.

☞ **Three Through Express Trains Daily!** ☜

Pullman's Celebrated Palace Sleeping Cars on all Night Trains!

☞ **FOR TICKETS,** apply at all Railroad Ticket Offices, and see that you get your Tickets via St. Louis and North Missouri Railroad.

C. N. PRATT, Gen. Eastern Agt., 111 Dearborn-st. CHICAGO.
S. H. KNIGHT, Gen. Superintendent, ST. LOUIS.

JAS. CHARLTON, Gen. Pass. and Ticket Agt., St. Louis.

Pacific Railroad of Missouri.

THE MOST DIRECT AND RELIABLE ROUTE FROM ST. LOUIS THROUGH TO

KANSAS CITY, LEAVENWORTH & ATCHISON,

☞ WITHOUT CHANGE OF CARS! ☜

Close Connections at KANSAS CITY with Missouri Valley, Missouri River, Ft. Scott & Gulf, and Kansas Pacific R'ys, for Weston, St. Joseph, Junction City, Fort Scott, Lawrence, Topeka, Sheridan, Denver, Fort Union, Santa Fe, and

ALL POINTS WEST!

☞ At SEDALIA, WARRENSBURG and PLEASANT HILL, with Stage Lines for Warsaw, Quincy, Bolivar, Springfield, Clinton, Osceola, Lamar, Carthage, Granby, Neosho, Baxter Springs, Fort Gibson, Fort Smith, Van Buren, Fayetteville, Bentonville.

PALACE SLEEPING CARS on all NIGHT TRAINS.

Baggage Checked Through Free!

THROUGH TICKETS for sale at all the Principal Railroad Offices in the United States and Canadas. **Be Sure and Get your Tickets over the PACIFIC R. R. OF MISSOURI.**

W. B. HALE, Gen. Pass. and Ticket Agt.
THOS. McKISSOCK, General Superintendent

THREE HOURS IN ADVANCE OF ALL OTHER ROUTES!

Sixty-One Miles the Shortest Line! Only 27 Hours!

— FROM —

CHICAGO TO NEW YORK.

Pittsburgh, Ft. Wayne & Chicago and Pennsylvania Central

IS THE ONLY ROUTE RUNNING ITS ENTIRE TRAIN THROUGH TO PHILADELPHIA AND NEW YORK, AND THE ONLY ROUTE RUNNING

THREE DAILY LINES OF PULLMAN'S DAY AND SLEEPING PALACES,

— FROM CHICAGO TO —

PITTSBURGH, HARRISBURG, PHILADELPHIA & NEW YORK,

☞ WITHOUT CHANGE! ☜

WITH BUT ONE CHANGE TO

BALTIMORE, PROVIDENCE, NEW HAVEN,

HARTFORD, SPRINGFIELD, WORCESTER AND BOSTON!

And the Most Direct Route to Washington City.

☞ Trains Leave WEST SIDE UNION DEPOT, corner West Madison and Canal Streets, as follows:

LEAVE:	Mail	Fast Express.	Pacific Exp.	Night Exp.	VALPARAISO ACCOMMODATION. Leaves CHICAGO daily, (except Sunday,) at 4:50 P. M.
CHICAGO	5.50 A. M.	11.00 A. M.	5.15 P. M.	9.00 P. M.	
PLYMOUTH	9.50 "	1.50 P. M.	s. 9.10 "	2.13 A. M.	
FORT WAYNE	12.40 P. M.	3.30 "	11.30 "	b. 5.30 "	
LIMA	3.15 "	.... "	1.25 A. M.	8.10 "	
FOREST	4.37 "	.... "	2.48 "	9.40 "	
CRESTLINE	6.00 A. M.	s. 6.55 "	4.30 "	D. 12.05 P. M.	
MANSFIELD	6.42 "	7.16 "	5.00 "	12.34 "	
ORRVILLE	9.05 "	8.42 "	6.45 "	2.27 "	
ALLIANCE	10.45 "	9.55 "	b. 8.40 "	3.55 "	
ROCHESTER	D. 2.05 P. M.	12.17 A. M.	10.52 "	6.02 "	South'n Exp.
PITTSBURGH	3.15 "	12.50 "	12.45 P. M.	s. 7.50 "	5.30 A. M
BLAIRSVILLE BRANCH	6.05 "	.... "	2.49 "	9.54 "	7.33 "
JOHNSTOWN	6.56 "	.... "	3.37 "	10.43 "	8.08 "
CRESSON	7.58 "	.... "	4.38 "	11.43 "	9.04 "
ALTOONA	s. 9.03 "	b. 4.40 "	s. 5.45 "	12.35 A. M.	b. 10.05 "
HUNTINGDON	10.31 "	.... "	7.04 "	1.45 "	11.14 "
LEWISTOWN	11.44 "	.... "	8.23 "	3.59 "	12.25 P. M.
HARRISBURG	2.10 A. M.	3.23 "	10.45 "	5.30 "	D. 2.50 "
LANCASTER	3.40 "	.... P. M.	12.15 A. M.	7.00 "	4.10 "
DOWNINGTON	5.00 "	.... "	1.40 "	b. 8.16 "	5.35 "
ARRIVE:					
PHILADELPHIA	6.30 "	12.20 "	8.10 "	9.40 "	7.00 "
NEW YORK, VIA PHILADELPHIA	10.41 "	3.00 "	6.43 "	1.00 P. M.	10.26 "
NEW YORK, VIA ALLENTOWN	.....	3.50 "	.....	12.05 P. M.	.....
BALTIMORE	.....	12.10 "	4.20 "	9.00 A. M.	7.00 "
WASHINGTON	.....	3.40 "	5.50 "	1.00 P. M.	10.00 "
BOSTON	9.00 P. M.	5.50 A. M.	5.05 P. M.	11.50 "	.....

THE FAST EXPRESS Leaves Chicago daily, except Sunday; the entire Train,—Baggage, Day and Pullman's Palace Cars—RUNNING THROUGH from Chicago to New York, via Mantua Junction; leaves Pittsburgh daily, except Monday. This train **reaches NEW YORK in time to make close connection for BOSTON!** No other Route through New York makes it! Arrives in BALTIMORE **Five Hours,** and WASHINGTON **Four Hours in Advance of Rival Routes!**

THE PACIFIC EXPRESS Leaves Chicago and Pittsburgh daily, for Philadelphia and New York, with PULLMAN PALACE CARS from Chicago; leaves Harrisburg for Baltimore daily, except Sunday; has SLEEPING CARS from Chicago to Pittsburgh, and from Altoona to Philadelphia. This train arrives in BALTIMORE **Nine Hours,** and WASHINGTON **Seven Hours, in Advance of all other Lines!**

THE NIGHT EXPRESS Leaves Chicago daily, except Saturday and Sunday; leaves Pittsburgh daily, except Sunday; leaves Harrisburg for Baltimore daily; has PULLMAN'S PALACE CARS from Chicago to Philadelphia and New York; has SLEEPING CARS from Chicago to Crestline, and from Pittsburgh to New York, Philadelphia and Baltimore. This train reaches BALTIMORE **Three Hours in Advance of competing Routes!**

THE MAIL Leaves Chicago daily, except Sunday, stopping at all Stations, and reaching Crestline the same evening [where passengers can transfer to Day Express]; leaves Crestline [Express,] the next morning, and leaves Pittsburgh daily, except Sunday. SLEEPING CARS from Pittsburgh to Philadelphia.

THE SOUTHERN EXPRESS Leaves PITTSBURGH daily, except Monday, with SILVER PALACE CARS to Philadelphia and New York; leaves Harrisburg for Baltimore daily, except Sunday.

BOSTON AND NEW ENGLAND PASSENGERS will find this Route especially Desirable, as it Gives them an opportunity of Seeing the FINEST VIEWS AMONG THE ALLEGHANY MOUNTAINS,

Besides Visiting PITTSBURGH, PHILADELPHIA and NEW YORK, without extra cost!

All New England Passengers holding Through Tickets, will be Transferred, with their Baggage, to Rail and Boat Connections in NEW YORK, WITHOUT CHARGE.

Close Connections Made at Lima for all Points on the Dayton & Mich. and Cin., Hamilton & Dayton R'ys,

And at CRESTLINE, for CLEVELAND, ERIE, DUNKIRK, BUFFALO, NIAGARA FALLS, and all Points reached via Lake Shore R.R.

THROUGH TICKETS for sale at the Company's Offices, at 65 Clark St., and also at 52 Clark St.; cor. Randolph and Wells St.; at N. E. corner of Randolph and LaSalle Sts.; and at Depot, Chicago. Also at Principal Ticket Offices in the West.

F. R. MYERS, Gen. Pass. and Ticket Agt, P. & F. W. R'y, Chicago. W. C. CLELAND, Gen. Western Pass. Agt, P. Ft. W. & C. R'y, Chicago.

T. L. KIMBALL, Gen. Western Pass. Agent, Penn. Central R. R., Chicago.

J. H. LINVILLE, PRESIDENT. J. L. PIPER, GEN. MANAGER. A. G. SHIFFLER, SUP'T & TREAS.

The Keystone Bridge Company

OF PITTSBURGH, PENN.

Office and Works, 9th Ward, Pittsburgh, Pa. Philadelphia Office, 426 Walnut Street.

GENERAL WESTERN OFFICE:—13 Fullerton Block, 94 Dearborn St., CHICAGO, ILL.

☞ This Company possess unrivaled facilities for manufacturing and erecting every description of **Iron and Wooden Railway and Road Bridges, Roofs, Turn-Tables and Buildings, "Linville and Piper" Patent Iron Bridges, Self-Sustaining Pivot Bridges, Suspension Bridges, and Ornamental Park Bridges.** Contractors for Wooden or Iron Bridges of any pattern, as per plans and specifications. Circulars sent on application.

WALTER KATTE, ENGINEER. A. D. CHERRY, SECRETARY.

PITTSBURGH CAST STEEL SPRING WORKS.

A. French & Co.,

Manufacturers of Extra Tempered, Light Elliptic

CAST STEEL SPRINGS,

FOR RAILROAD CARS AND LOCOMOTIVES,

FROM BEST CAST STEEL.

OFFICE AND WORKS:—Cor. Liberty and 21st Sts., PITTSBURGH, PA.

CHICAGO BRANCH, 88 Michigan Ave.

Broad Gauge! Double Track!

ERIE RAILWAY.

4 EXPRESS TRAINS DAILY!

From Cleveland, Dunkirk and Buffalo, 625 Miles, to New York, WITHOUT CHANGE of Coaches!

☞ The Trains of this Railway are run in DIRECT CONNECTION WITH ALL WESTERN AND SOUTHERN LINES, for

Elmira, Williamsport, Oswego, Great Bend, Scranton, Newburgh,

NEW YORK, ALBANY, BOSTON, PROVIDENCE,

AND PRINCIPAL NEW ENGLAND CITIES.

New and Improved DRAWING ROOM COACHES are attached to the DAY EXPRESS Running THROUGH TO NEW YORK.

☞ **SLEEPING COACHES, Combining all Modern Improvements,** with perfect Ventilation and the peculiar arrangements for the comfort of Passengers incident to the **BROAD GAUGE,** accompany all night trains to New York.

CONNECTIONS CERTAIN! as Trains on this Railway will, when necessary, **wait from one to two hours for Western trains.**

All Trains of Saturday run directly Through to New York.

☞ **Ask for Tickets via Erie Railway,** which can be procured at **66 Clark Street,** Chicago, and at all Principal Ticket offices in the West and Southwest.

L. D. RUCKER, Gen'l Superintendent, New York. | **A. J. DAY,** Western Passenger Agent, Chicago. | **WM. R. BARR,** Gen'l Passenger Agent, New York

LAKE SHORE
— AND —
MICHIGAN SOUTHERN R.W.

THE GREAT THROUGH LINE BETWEEN

CHICAGO, BUFFALO & NEW YORK,
WITHOUT CHANGE!

AND THE ONLY RAILWAY

RUNNING PALACE COACHES THROUGH!

— BETWEEN —

CHICAGO & NEW YORK, via BUFFALO

☞ **WITHOUT TRANSFER OF PASSENGERS!** ☜

All Trains Stop at Twenty-Second Street to Take and Leave Passengers. Baggage Checked at that Station for all Points East.

4 EXPRESS TRAINS DAILY, [Sundays Excepted,] Leave Chicago from the New Depot, on Van Buren St., at the head of La Salle Street, as follows

7:30 A. M. MAIL TRAIN.
VIA OLD ROAD AND AIR LINE. SUNDAYS EXCEPTED.

Leaves 23d Street 7:45 A. M. Stops at all Stations. **Arrives**—Toledo, 6:20 P. M.

11:30 A. M. SPECIAL NEW YORK EXPRESS,
-A AIR LINE. SUNDAYS EXCEPTED.

Leaves—Twenty-Second Street, **11:45 A. M. Arrives**—Elkhart, 2:55 P. M.; Cleveland 10:40 P. M.; Buffalo, 4:10 A. M.: New York, 5:30 P. M.; (Chicago Time) Boston, 11:45 P. M.

This Train has PALACE SLEEPING COACH Attached, Running

THROUGH TO ROCHESTER, WITHOUT CHANGE!

IN DIRECT CONNECTION WITH

Wagner's Celebrated Drawing-Room Coaches on N. Y. Central R. R.

Only Thirty Hours, Chicago to New York!

5:15 P. M. ATLANTIC EXPRESS (Daily),
VIA OLD ROAD.

Leave—Twenty-Second Street **5:30 P. M. Arrives**—Laporte, 8:10 P. M. (Stops 20 minutes or Supper): arrives at Toledo, 2:50 A. M.; Cleveland, 7:25 A. M. (20 minutes for Breakfast); arrives at Buffalo, 1:50 P. M.; Rochester, 5:10 P. M. (20 minutes for Supper); connects with **Sleeping Coach running Through from Rochester to Boston Without Change,** making but **One Change between Chicago and Boston.**

NEW AND ELEGANT SLEEPING COACH Attached to this Train, Running THROUGH from CHICAGO TO NEW YORK WITHOUT CHANGE! Arrives at NEW YORK, 6:40 A. M.

9:00 P. M. NIGHT EXPRESS
VIA AIR LINE. (DAILY EXCEPT SAT. & SUN.)

Leaves—Twenty-Second Street, **9:15 P. M. Arrives**—Toledo, 6:00 A. M. (20 minutes for Breakfast); arrives at Cleveland, 10:35 A. M.; Buffalo, 5:30 P. M.; New York, 11:00 A. M.; Boston, 3:50 P. M.

KALAMAZOO DIVISION.

Leave Chicago 11:30 A. M. Arrive at Kalamazoo 5:30 P. M.; Grand Rapids, 8:15 P. M.

Leave Chicago 9:00 P. M. Arrive at Kalamazoo 7:10 A. M.; Grand Rapids, 10:20 A. M.

Elkhart Accommodation leaves Chicago, 3:30 P. M. Arrives at Elkhart, 8:20 P. M.

☞ There being no heavy grades to overcome, or mountains to cross, the road bed and track being the smoothest and most perfect of any railway in the United States, this Company run their trains at a high rate of speed with perfect safety.

☞ Travelers who wish to SAVE TIME and make SURE CONNECTIONS, purchase Tickets via

LAKE SHORE & MICHIGAN SOUTHERN R'Y.

THE ONLY LINE RUNNING THROUGH BETWEEN CHICAGO AND BUFFALO, WITHOUT TRANSFER, and in Direct Connection with NEW YORK CENTRAL RAILROAD and ERIE RAILWAY.

General Ticket Office for Chicago, No. 56 Clark Street.

CHAS. F. HATCH,
General Superintendent, CLEVELAND, OHIO

F. E. MORSE,
General Western Passenger Agent, CHICAGO.

ILLINOIS CENTRAL RAILROAD.

PASSENGER TRAINS LEAVE CHICAGO FROM THE GREAT CENTRAL DEPOT, FOOT OF LAKE ST

ST. LOUIS AND CHICAGO
THROUGH LINE.

9:30 A. M. DAY EXPRESS Sundays Ex
Arriving in ST. LOUIS at 10:15 P. M.

☞ This Train Reaches St. Louis ONE HOUR & FIFTEEN MINUTES in Advance of any other Route! ☜

8:30 P. M. FAST LINE. Saturdays Excepted.
Arriving at ST. LOUIS at 8:00 A. M.

AT ST. LOUIS, Direct Connections are Made FOR

Jefferson City, Sedalia, Pleasant Hill, Macon, Kansas City,

LEAVENWORTH, ST. JOSEPH & ATCHISON,

—Connecting at KANSAS CITY for—

LAWRENCE, TOPEKA, JUNCTION CITY, SALINA, SHERIDAN, &c.

CAIRO, MEMPHIS AND NEW ORLEANS LINE.

9:30 A. M. CAIRO MAIL, Sundays Excepted.
Arriving at **Cairo** 2:20 A. M., **Memphis** 12:40 P. M., **Mobile** 9:40 A. M **Vicksburg** 9:30 A. M., **New Orleans** 11:10 A. M.

8:30 P. M. CAIRO EXPRESS, Except Saturdays.
Arriving at **Cairo** 3:15 P. M., **Memphis** 2:30 A. M., **Vicksburg** 5:00 P. M., **New Orleans** 1:30 A. M.

4:55 P. M. CHAMPAIGN PASSENGER,
Arriving at **Champaign** at 11:15 P. M.

☞ **THIS IS THE ONLY DIRECT ROUTE TO**

Humboldt, Corinth, Grand Junction, Little Rock, Selma, Canton, Grenada, Columbus, Meridian, Enterprise,

MEMPHIS, VICKSBURG, NEW ORLEANS & MOBILE.

At NEW ORLEANS, connections are made for

GALVESTON, INDIANOLA,

And all Parts of Texas.

☞ **NOTICE.—This Route is from 100 to 150 MILES SHORTER, and from 12 to 24 HOURS QUICKER than any other.**

THIS IS ALSO THE ONLY DIRECT ROUTE TO

DECATUR, TERRE HAUTE, VINCENNES & EVANSVILLE.

Peoria and Keokuk Line.

9:30 A. M. KEOKUK PASSENGER, Sun. Excepted.
Arriving at **Chenoa** 3:15 P. M., **El Paso** 4:05 P. M., **Peoria** 5:40 P. M., **Canton** 7:14 P. M., **Bushnell** 8:59 P. M., **Keokuk** 11:26 P. M., **Warsaw** 12:05 A. M.

Elegant Drawing Room Sleeping Cars

ATTACHED TO ALL NIGHT TRAINS.

Spacious and Fine Saloon Cars!

WITH ALL MODERN IMPROVEMENTS, RUN UPON ALL TRAINS.

BAGGAGE CHECKED THROUGH TO ALL IMPORTANT POINTS.

☞ For Through Tickets, Sleeping Car Berths, Baggage Checks, and information, apply at the office of the Company in the Great Central Depot, foot of Lake St.

Hyde Park and Oakwoods Train.

	LEAVE.	ARRIVE.		LEAVE.	ARRIVE.
HYDE PARK TRAIN,...	*6:30 A. M.	*7.45 A. M.	HYDE PARK TRAIN,....	*3:00 P. M.	*5:15 P. M.
HYDE PARK TRAIN,...	*8:00 A. M.	*9.15 A. M.	HYDE PARK TRAIN,....	*6:10 P. M.	*7:35 P. M.
HYDE PARK TRAIN,..	*12:10 P. M.	*1:50 P. M.			

* Sundays Excepted.

W. P. JOHNSON, Gen. Pass. Agent. **M. HUGHITT, Gen. Supt.**

1870. Great Central Route! 1870.

SPEED! COMFORT! SAFETY!

MICHIGAN CENTRAL and GREAT WESTERN RAILWAYS!

The Great Central Route, via Niagara Falls, to

NEW YORK AND NEW ENGLAND.

Pullman's Magnificent Palace Drawing-Room Cars,

— FROM —

CHICAGO TO NEW YORK CITY, WITHOUT CHANGE.

4 PASSENGER TRAINS LEAVE CHICAGO, DAILY EXCEPT SUNDAY.
(DEPOT, FOOT OF LAKE STREET,) as Follows:

5:00 A. M. MAIL TRAIN. Stops at all Stations.
(SUNDAYS EXCEPTED.) Arrives DETROIT at 5:40 P. M.

11:30 A. M. SPECIAL NEW YORK & BOSTON EXP.
(SUNDAYS EXCEPTED.) Arrives at Michigan City 1:13 P.M.; New Buffalo 1:33, Niles 2:15, [Dinner], Kalamazoo 3:52 P. M.; Battle Creek 4:28, Marshall 4:48, Jackson 5:45, Detroit 7:55, London 12:05, A. M. Hamilton 2:35 A. M.; Toronto 9:30, Suspension Bridge 3:55, Rochester 7:00 A. M.; Albany, 2:00 P. M.; NEW YORK, 6:25, BOSTON, 11:50 P. M. ☞ This train connects at ROCHESTER (7:00 A. M.) with

Wagner's Magnificent Palace Drawing-Room Cars!

☞ RUNNING THROUGH TO NEW YORK, WITHOUT CHANGE! ☜

5:15 P. M. ATLANTIC EXPRESS.
(DAILY.) Arrives at Michigan City, 7:18 P. M.; Niles 8:30 P. M. [Supper]; Kalamazoo, 10:25 P. M.; Jackson, 1:00 A. M.; Detroit 3:40, London, 8:25, [Breakfast]; Hamilton 11:40, Suspension Bridge 1:30 P. M.; Rochester 5:00 P. M.; Albany, 1:30 A. M.; NEW YORK, 6:40 A. M.; BOSTON, 11:00 A. M.
A MAGNIFICENT DRAWING-ROOM SLEEPING CAR is attached to this train daily, FROM CHICAGO TO NEW YORK CITY. The celebrated

☞ Hotel Drawing-Room Car is also attached to this Train from Chicago to Rochester! ☜

☞ These, together with **ELEGANT DAY CARS TO SUSPENSION BRIDGE,** make this Train the favorite Train for all points East.

SPECIAL NOTICE.—Boston and New England Passengers will please notice that this Train now makes direct connection through. A SLEEPING CAR is attached at Rochester at 5.20 P. M., running through to Springfield, Mass., thus avoiding transfer at Albany. Breakfast at Springfield. This Train reaches Springfield early enough second morning to **Connect with all Trains** up and down the Connecticut.

9:00 P. M. NIGHT EXPRESS.
(SAT. & SUN. EXCEPTED). Arrives at Michigan City, 11:03 P. M.; Niles, 12:25 A. M.; Kalamazoo, 2:00; Marshall, 2:12; Jackson, 4:25; Grand Trunk Junction, 7:00; Detroit, 7:30; London, 1:45 P. M.; Hamilton, 4:35; Toronto, 9:35; Niagara Falls, 6:15; Buffalo, 7:15 P. M.; Rochester, 9:10; Syracuse, 12:35 A. M.; Rome, 1:55; Utica, 3:25; Albany, 6:30 A. M.; NEW YORK, 10:00 A. M.; BOSTON, 3:40 P. M.

PULLMAN'S PALACE SLEEPING CARS ARE ATTACHED TO THIS TRAIN FROM CHICAGO TO DETROIT,
And from Suspension Bridge to New York.

WE INVITE THE ATTENTION OF THE TRAVELER to the SPLENDID EQUIPMENTS of this FIRST-CLASS LINE TO THE EAST!

☞ FOR THROUGH TICKETS, and any and all information, Sleeping Car accommodations, &c., apply at General Office in Tremont House Block, at office in Great Central Depot; also at No. 60 Clark street, under Sherman House; at Grand Trunk Railway Office, 48 Clark street, or at New York Central Railroad Office, No. 53 Clark street, and at office under Briggs House.

H. E. SARGENT, Gen. Supt. M. C. R. R. W. K. MUIR, Gen. Supt. Gt. Western R. W. HENRY C. WENTWORTH, Gen. Pass. Agt.

CHICAGO, INDIANAPOLIS & LOUISVILLE

THROUGH LINE!

—VIA—

MICHIGAN CENTRAL RAILROAD.

THE ONLY ROUTE TO

TO LOUISVILLE, WITHOUT CHANGE OF CARS.

TWO EXPRESS TRAINS Leave Chicago Depot, Foot of Lake as Follows:

9:00 A. M. MORNING EXPRESS.
(EXCEPT SUNDAY.) Arriving at LaFayette, 9:25 P. M.; Indianapolis, 6:00 P. M.; Louisville, 11:30 P. M.

4:30 P. M. AFTERNOON EXPRESS.
(EXCEPT SATURDAY.) Arriving at Michigan City 6:20 P. M. [Supper]; LaFayette, 11:30 P. M. Indianapolis, 2:15 A. M.; Louisville, 7:00 A. M.; Nashville, 4.00 P. M.

A GOOD SLEEPING CAR is Attached to this Train Every Night,
And goes from Chicago to Louisville WITHOUT CHANGE!

☞ **SPECIAL NOTICE.**—This Train stops at Michigan City for Supper, and waits at that point for Michigan Central Atlantic Express East, leaving Chicago at 4:45 p. m. Passengers going South, and wishing as much time in Chicago as possible, can take the 4:45 p. m. Michigan Central Atlantic Express, and connect without fail at Michigan City, with above Through Louisville Express.

☞ **THE GREAT BRIDGE ACROSS THE OHIO** at Louisville being completed, passengers are relieved of the omnibus transfer.

FOR THROUGH TICKETS, via this line, apply at offices of connecting lines and at all Ticket offices in Chicago.

HENRY C. WENTWORTH, Gen. Pass. Agent.

Michigan Central R. R.

LOCAL CONNECTIONS:

Chicago & Michigan Lake Shore Railroad.
Open from New Buffalo to St. Joseph, Mich.
5:00 A. M. AND 4:30 P. M. Trains from Chicago Connect at New Buffalo.

Kalamazoo, Allegan & Grand Rapids R. R.
Open to Grand Rapids.
11:30 A. M. AND 9:00 P. M. Trains from Chicago Connect at Kalamazoo.

Peninsular Railroad of Michigan.
Open to Charlotte.
5:00 A. M. AND 9:00 P. M. Trains from Chicago Connect at Battle Creek.

Jackson, Lansing & Saginaw Railroad.
Open to Bay City, Mich. Passing through Lansing and Saginaw.
5:00 A. M. AND 9:00 P. M. Trains from Chicago Connect at Jackson.

GRAND TRUNK RAILWAY.

All Michigan Central Trains Connect at Grand Trunk Junction
— FOR —
SARNIA, TORONTO, MONTREAL,
PORTLAND, BOSTON, BUFFALO, OGDENSBURG
AND ALL POINTS EAST.

H. E. SARGENT, General Superintendent

WHAT IS SAID OF THE RAILROAD GAZETTE.

"Has been for thirteen years a live, energetic railroad newspaper, and has fought its way up among its many competitors for the favor of the railroad public, gaining in strength and rising in importance year by year, until to-day it stands second to no journal of that important class in the United States."—*Peoria Daily Transcript.*

"A very neat publication in point of appearance, and, as it always has been, is now a reliable, interesting and accurate journal, ably edited in its various departments. * * Our scissors have wandered over its columns "many a time and oft," and always with gratifying results."—*Buffalo Commercial Advertiser.*

"The news is very full, the discussions are conducted in good temper and with excellent information. To judge from this first number, the conductors of the GAZETTE know what "railroading" is, and what a proper weekly journal should be."—*New York World.*

"One of our most valuable exchanges. * * * Its columns teem with reliable information of great benefit to railroad men of every section of the United States."—*Leavenworth Bulletin.*

"Emphatically a journal of transportation, and contains every conceivable item of news on the subject of railroads, steamboats, telegraphs, express companies, etc."—*Flint (Mich) Globe.*

"Full of information, scientific and general, with regard to railroads all over the country, their construction, operation, etc."—*Rochester Chronicle.*

"For railroad men and others wishing to keep themselves thoroughly posted on railroad matters we know of no better paper."—*Madison State Journal.*

"A most valuable thing to the engineer and all railway men, the capitalist, traveler, mechanic and general reader."—*Brooklyn (N. Y.) Argus.*

"As it devotes much attention to Southern railroad and industrial interests, it is always interesting to Southern readers."—*Galveston News.*

"Has always been one of the best papers of the country for railroad intelligence."—*New York Commercial and Financial Chronicle.*

"In every respect a worthy representative of the energetic and go-ahead city where it is published."—*Cincinnati Railroad Record.*

"Every man who is at all interested in railroads would do well to take the GAZETTE."—*Jacksonville (Ill.) Independent.*

"Of great interest to railroad men, and almost equally so to those who use railroads."—*Marshall (Mich.) Statesman.*

"Makes a very handsome appearance and is full of valuable matter."—*Chicago Evening Post.*

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